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A Review of the Phytoseiidae(Mesostigmata: Acarina) from Korea

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Abstarct This study comprises a review of the illustration, description, and key of the family Phytoseliidae from Korea. It deals with two subfamilies, three genera, five subgenera, and twenty seven species including a new species, *Phytoseius* (*Phytoseius*) *crenatus* n. sp. and a newly recorded species, *Amblyseius* (*Amblyseius*) *makuwa* Ehara from this country.

Key words Taxonomy, Acarina, Phytoseiidae, Key, Korea

INTRODUCTION

Adult mites of the family Phytoseiidae are 300-600㎛ long and are predators of plant feeding mites. They feed on tetranychids, tenuipalpids, tarsonemids, tydeids, acarids, eriophyids, but mainly on one of the most impotant phytophagous mites, tetranychids. Therefore, many phytoseiids are now used as biological control agents in a number of agricultural ecosystems. Their prey is egg, larva, nymph, and adult of phytophagous mites, and sometimes pollen, honey dew, and plant juices. There are five developmental stages in the life cycle of phytoseiids i. e., egg. larva, protonymph, deutonymph, and adult. Their body is white, light brown, and brown in colour. They are found in a variety of terrestrial habitats such as arctic, tundra, high mountains, desert, and tropics.

Korean phytoseiid mites have been described by Lee (1961), Lee and Ryu (1989), Denmark and Muma (1989), Ryu and Ehara (1990, 1991, and 1992), and Ryu and Lee (1992). Up to the present, 25 species of phytoseiid mites have been recorded from Korea. This paper contains illustration, description, and key of 27 phytoseiids species including a new species and a newly recorded from this country. Korean fauna of Phytoseiidae comprises 2 subfamilies, 3 genera, 5 subgenera, and 27 species. The setal nomenclature follows that of Rowell *et al.* (1978) (Figs. 1-2). All measurements are given in micrometers. All specimens were collected by author.

The type series of the new species is deposited in the Department of Biology, College of Natural Sciences, Chonbuk National University. Localities are abbreviated as follows: JB-Jeonbuk(=Chonbuk); JN-Jeonnam(=Chonnam); CB-Chungbuk; (=Kyonggi); GB-Gyonbuk(=Kyongbuk); GN-Gyongnam(=Kyongnam).

Key to the species. subgenera, genera, and subfamiles of Phytoseiidae (Female)

1. Proscutum with four pairs of lateral setae (j3, z2, z4, and s4) ····· ····Subfamily Amblyseiinae·····Genus *Amblyseius*(s. str.)·····2

   Proscutum with six pairs of lateral setae(j3, z2, z3, z4, s4, and s6) ····Subfaimly Phytoseiinae·····14

2. Setae j4, j5, j6, and J2 longer than distance between their bases ····· *longispinosus*

   Setae j4, j5, j6, and J2 shorter than distance between their bases ····· 3

3. Peritreme very short, extending to coxa Ⅱ ····· *finlandicus*

   Peritereme long, extending beyond coxa Ⅱ ····· 4

4. Seta s4 longer than distance between base of setae s4 and z5 ····· 5

   Seta s4 shorter than distance between base of setae s4 and z5 ····· 9

5. Macroseta on genu Ⅳ shorter than that of basitarsus Ⅳ ····· *rademacheri*

   Macroseta on genu Ⅳ longer than that of basitarsus Ⅳ ····· 6

6. Macroseta on tibia Ⅳ shorter than that of basitarsus Ⅳ ····· 7

   Macroseta on tibia Ⅳ longer than that of basitarsus Ⅳ ····· 8

7. Spermatheca long, side of cervix granular externally ····· *obtuserellus*

   Spermatheca short, side of cervix smooth externally ····· *koreaensis*

8. Seta z2 longer than z4. Ventrianal shield vase shaped ····· *eharai*

   Seta z2 shorter than z4. Ventrianal shield pentagonal ····· *orientalis*

9. Dorsal shield generally reticulate ····· 10

   Dorsal shield smooth or laterally reticulte ····· 11

10. Leg Ⅳ with one macroseta ····· *koyamanus*

    Leg Ⅳ with three macrosetae ····· *quaesitus*

11. Seta Z4 shorter than distance between base of setae Z4 and Z5 ····· 12

    Seta Z4 as long as distance between base of setae Z4 and Z5 ····· 13

12. Seta Z5 above twice as long as Z4 ····· *okinawanus*

    Seta Z5 less than twice as long as Z4 ····· *makuwa*

13. Seta j3 shorter than j1 ····· *oguroi*

    Seta j3 longer than j1 ····· *volgini*

14. Postscutum with at least three pairs of setae in addition to setae J5, Z4, and Z5; seta r3 on interscutal membrane ····· Genus *Typhlodromus* Scheuten·····15

    Postscutum with only setae J5, Z4, and Z5; seta r3 on dorsal shield ····· Genus *Phytoseius*·····

    Subgenus *Phytoseius* ····· 22

15. Seta z6 present ····· Subgenus *Paraseiulus*·····16

    Seta z6 absent ····· 17

16. Ventrianal shield with four pairs of preanal setae ····· *yokogawae*

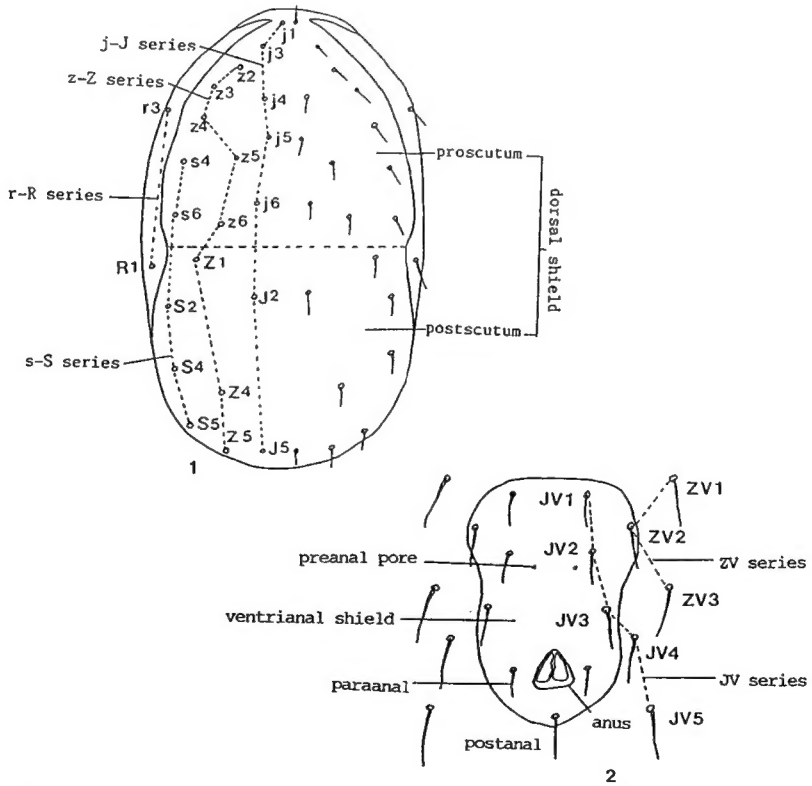
    Ventrianal shield with two pairs of preanal setae ····· *deogyuensis*

17. Setae S4 and R1 absent ····· Subgenus *Galendromus*·····*occidentalis*

    Setae S4 and R1 present ····· Subgenus *Anthoseius*·····18

18. Ventrianal shield with three pairs of preanal setae(JV3 absent on ventrianal shield) ····· *wonkooi*

Ventrianal shield with four pairs of preanal setae(JV3 present on ventrianal shield) ·····19
19. Sternal shield with two pairs of setae(seta ST3 absent on sternal shield) ·····*yasumatsui*
Sternal shield with three pairs of setae(seta ST3 present on sternal shield) ·····20
20. Macroseta on genu Ⅳ shorter than that of tibia Ⅳ ·····*serrulatus*
Macroseta on genu Ⅳ longer than that of tibia Ⅳ ·····21
21. Seta Z4 longer than distance between base of setae Z4 and S5 ·····*vulgaris*
Seta Z4 shoeter than distance between base of setae Z4 and S5 ·····*chinensis*
22. Ventrianal shield with one pair of preanal seta ·····*blakistoi*
Ventrianal shield with three pairs of preanal setae ·····23
23. Macroseta on genu Ⅳ absent ·····24
Macroseta on genu Ⅳ present ·····26
24. Macroseta on tibia Ⅳ less than twice as long as that of basitarsus Ⅳ ·····*capitatus*
Macroseta on tibia Ⅳ more than twice as long as that of basitarsus Ⅳ ·····25
25. Seta Z4 shorter than Z5 ·····*nipponicus*
Seta Z4 longer than Z5 ·····*crenatus* n. sp.
26. Seta s4 longer than Z5 ·····*mori*
Seta s4 about as long as Z5 ·····*koreanus*



Figs. 1-2. Chaetotactic nomenclature of the setae of a phytoseiid mite. 1. the dorsum of idiosoma; 2. the posterior ventral surface.(Rowell *et al.*, 1978).

***Amblyseius* (*Amblyseius*) *longispinosus* (Evans) 긴털이리응애 (Figs. 3-10)**

Typhlodromus longispinosus Evans, 1952, p. 413, figs. 1-2; Womersley, 1954, p. 176-177, fig. 3A-D; Ehara, 1958, p. 55, figs. 4-6.

Amblyseius longispinosus (Evans): Ehara, 1959, p. 228; Ehara, 1964, p. 382; Corpuz and Rimando, 1966, p. 129-132, fig. 10a-e; Gupta, 1975, p. 38; Collyer, 1982, p. 192, 200, fig. 13A-C.

Amblyseius (*Amblyseius*) *longispinosus* (Evans): Ehrara, 1967, p. 74; Ehara, 1970, p. 56; Ehara, 1975, p. 29, fig. 9; Ehara, 1977, p. 36; Ehara, 1980, p. 63, fig. 19-A; Lee and Ryu, 1989, p. 219-220, fig. 3A-G; Ryu and Ehara, 1990, p. 148, fig, 13.

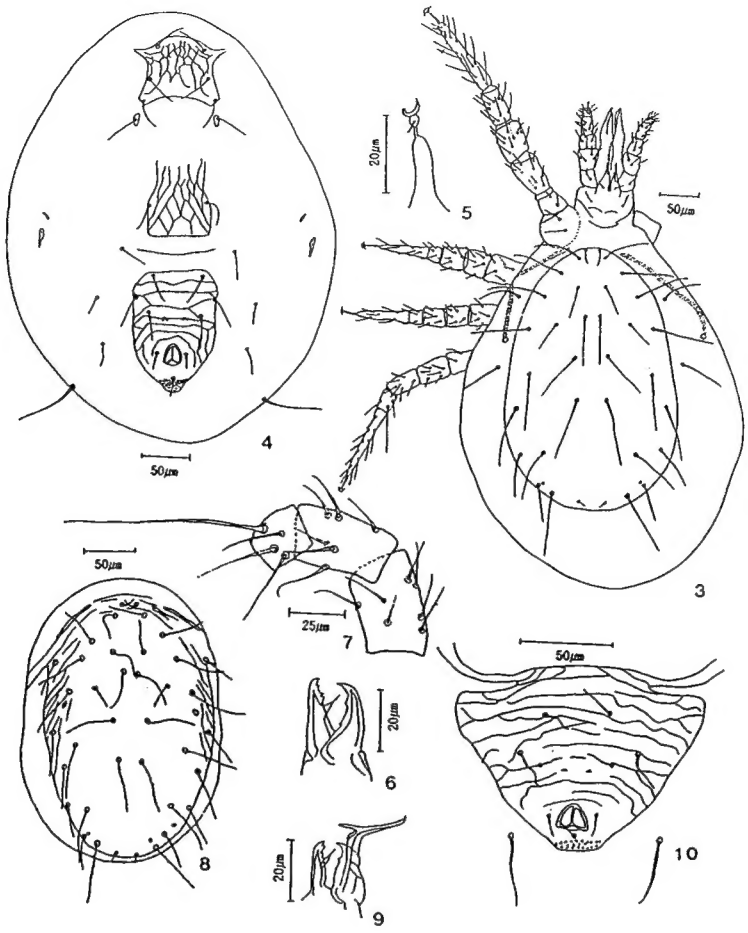
Female. Dorsal shield 336 long, 176 wide at level of waist; slightly reticulate, with a pair of pores near S5 and with 17 pairs of setae. Setae on dorsal shield longer than the base of neighboring setae except for setae j1 and z5. Setae r3 and R1 interscutal membrane, slightly barbed. peritreme extending to the level of seta j3. Sternal shield with posterior margin slightly concave, with 3 pairs of setae; metastenal platelets longer than width. Ventrianal shield wider than genital shield; with 3 pairs of preanal setae, a pair of pores. Setae JV5 smooth. 2 pairs of slender metapodal platelets. Spermatheca with cervix bell-shaped. Fixed digit with 3 teeth and pilus dentilis; mobable digit with 2 teeth. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/01; genu Ⅲ, 1-2/1, 2/0-1. Leg Ⅳ with a macroseta on basitarsus. Lengths of setae (n=10, mean); j1 20.0, j3 59.4, j4 53.3, j5 61.5, j6 69.1, J2 75.1, J5 9.0, z2 65.0, z4 69.5, z5 35.5, Z1 74.6, Z4 71.7, Z5 83.1, s4 77.6, S2 71.3, S4 59.2, S5 45.7, r3 54.0, R1 58. 3, JV5 64.6, macrosetae on; basitarsus Ⅳ 82.3.

Male. Setae r3 and R1 on dorsal shield. Pertreme extending to seta z2. Ventrianal shield fused with peritrematal shield; 3 pairs of preanal setae, a pair of pores. Chelicera with 3 teeth and pilus dentilis on fixed digit; movable digit with unidentate. Spermatodactyl as figured. Lengths of setae(n=10, mean): j1 15.4, j3 41.9, j4 36.6, j5 41.6, j6 47.9, J2 52.0, J5 8.0, z2 43.8, z4 49.7, z5 22.6, Z1 51.1, Z4 53.7, Z5 57.0 s4 56.4, S2 49.5, S4 34.5, S5 23.4, r3 31.1, R1 34.5. JV5 35.7, macrosetae on basitarsus Ⅳ 64.7.

Specimens examined. 7♀, Chonju, JB, 10-Ⅵ-1988, on *Althaea rosea* Cav.; 7♀ & 2♂, Chonju, JB, 16-Ⅵ-1988, on *Humulus japonicus* S. et Z.; 12♀ & 7♂, Kunsan, JB, 23-Ⅵ-1988, on *Althaea rosea*; 10♀ & 4♂, Iri, JB, 7-Ⅶ-1988, on *Korria japonica* (L.) Dc.; 3♀, Chonju, JB, 22-Ⅶ-1988, on *Hemiptelea davidii* Fisch.; 2♀♀, Haeundae, Pusan, 31-Ⅶ-1988, on *Alnus hirsuta*(Spach) Rupr.; 1♀, Chonju, JB, 2-Ⅷ-1988, on *Castanea crenata* S. et Z.; 5♀ & 2♂, Kunsan, JB, 6-Ⅶ-1989, on *Althaea rosea*; 1♀, Chonju, JB, 7-Ⅷ-1992, on *Boehmeria spicata* Thunb.; 6♀, Yongdok, GB, 27-Ⅶ-1989, on *Prunus serrulata* Lindley var. *spontanea* (Maxim.) Makino; 3♀, Yongdok, GB, 27-Ⅶ-1989, on *Juglans sinensis* Dode; 4♀, Kangrung, GW, 11-Ⅷ-1989, on *Prunus serrulata* var. *spontanea*; 7♀, Yonchon, GG, 16-Ⅺ-1989, on *Rubus crataegifollus* Bunge; 1♀, Tanyang, CB, 31-Ⅶ-1990, on *Vitis amurensis* Rupr.

Distributions · Korea, Australia, China, Hong Kong, Hawaii, India, Indonesia, Jameica, Japan, New Zealand, South Africa, Taiwan, Thailand, The Philippines.

Remarks · *A. longispinosus* has generally long dorsal setae and is cosmopolitan. This species was collected on *Althaea rosea* together with spider mite, *Tetranychus urticae* Koch.



Figs. 3-10. *Amblyseius longispinsus* (Evans). 3, dorsum(♀); 4, venter of idiosoma(♀); 5, spermatheca; 6, chelicera(♀); 7, basitarsus, tibia, and genu of leg Ⅳ(♀); 8, dorsum of idiosoma(♂); 9, chelicera(♂); 10, ventrianal shield(♂).

***Amblyseius* (*Amblyseius*) *finlandicus* (Oudemans) 순이리응애 (Figs. 11-19)**

Seiulus finlandicus Oudemans, 1915, p. 183.

Typhlodromus finlandicus (Oudemans), Nesbitt, 1951, p. 25-26, plate Ⅲ, plate Ⅸ fig. 5, plate Ⅹ fig. 12, plate Ⅺ fig. 19.; Evans, 1953, p. 466; Womersley, 1954, p. 182; Ehara, 1958, p. 53-55, figs. 1-3.

Amblyseius finlandicus (Oudemans): Chant, 1959, p. 67, figs, 94-95; Ehara, 1959, p. 285; Athias-Henriot, 1960, p. 296-298, fig. 4; Chant and Hansell, 1971, p. 706. figs. 1-4; Gupta, 1975, p. 36; Bayan, 1985, p. 26, fig. 9.

Amblyseius(*Amblyseius*) *finlandicus* (Oudemans): Ehara, 1967, p. 231; Ehara, 1975, p. 27; Ehara, 1977, p. 35: Ehara, 1980, p. 59, fig. 17-D; Ryu and Ehara, 1990, p. 147-149, figs. 15-22.

Euseius finlandicus (Oudemans): Miedema, 1987, p. 13-15, fig. 11a-f.

Female. Dorsal shield 290 long, 324 wide at level of waist, slightly reticulate, with at least 3 pairs of small pores, Setae on dorsal shield: Z5 the longest, slightly barbed, j3 as long as j1, the remaining

setae shorter, smooth, Setae r3 and R1 on interscutal membrane, smooth. Peritreme short, extending to the level of coxa Ⅱ. Sternal shield with posterior margine not straight, with 3 pairs of setae; metasternal platelets longer than width. ventrinanal shield oate, wider than genital shield; 3 pairs of preanal setae; a pair of pores. Seta JV5 smooth. 2 pairs of slender metapodal platelets. Spermatheca as figured. fixed digit with 5 teeth and pilus dentilis; movable digit unidentate. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1, 2/0-1. Leg Ⅳ with 3 macrosetae, Lengths of setae (n=10, mean): j1 28.5, j3 27.1, j4 13.1, j5 13.6, j6 16.4, J2 17.1, J5 4.7, z2 20.4, z4 22.0, z5 13.7, Z1 16.3, Z4 17.7, Z5 53.2, s4 31.8, S2 20.0, S4 19.9, S5 21.6, r3 15.1, R1 13.1, JV5 36.2, macrosetae on leg Ⅳ: genu 35.6, tibia 33.7, basitarsus 59.3.

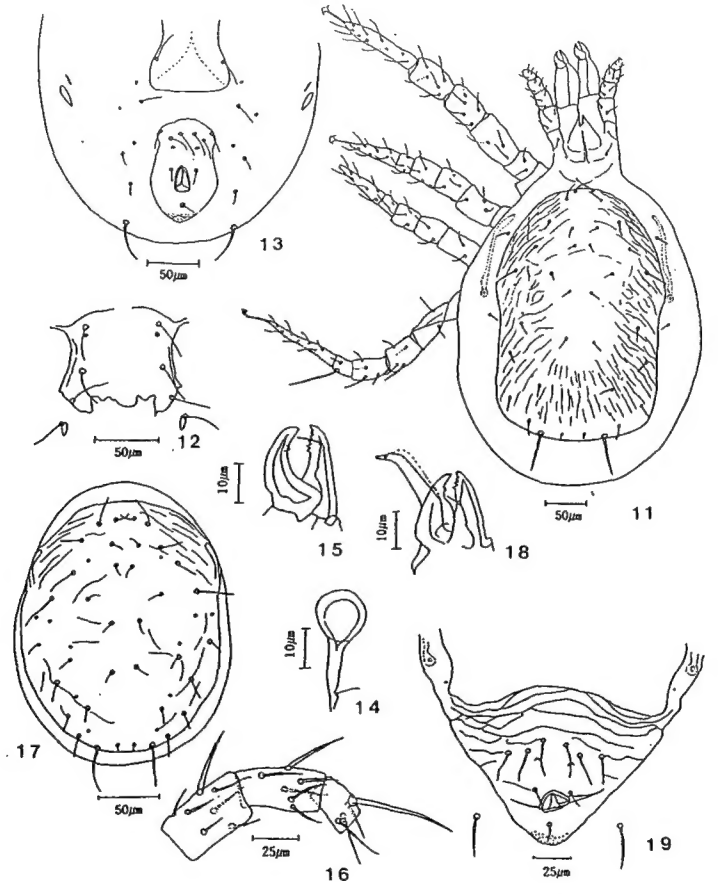
Male. Setae r3 R1 on dorsal shield. Peritreme extending to the level of coxa Ⅱ. Ventrianal shield fused with peritrematal shield; 3 pairs of preanal setae, a pair of pores. Chelicera with 3 teeth and pilus dentilis on fixed digit; movable digit unidentate. Spermatodactyl as figured. Lengths of setae(n =10, mean); j1 24.1, j3 26.8, j4 11.1, j5 11.0, j6 12.4, J2 12.5, J5 4.0, z2 17.8, z4 19.3, z5 10.9, Z1 12. 4, Z4 14.8, Z5 43.9, s4 28.6, S2 17.6, S4 19.0, S5 20.2, r3 13.8, R1 10.5, JV5 26.7, macrosetae on leg Ⅳ: genu 29.6, tibia 31.0, basitarsus 48.8.

Specimens examined. 12♀ & 2♂, Kui, Wanju, JB, 6-Ⅵ-1988, on *Castanea crenata* S. et Z.; 16♀ & 3♂, Wansanchilbong, Chonju, JB, 2-Ⅷ-1988, on *Castanea crenata;* Wansanchilbong, Chonju, JB, 2 -Ⅷ-1988, on *Alnus hirsuta*(Spach) Rupr.; 5♀ & 1♂, Chonju, JB. 5-Ⅷ-1988, on *prunus serrulata* Lindley var. *spontanea*(Maxim.) Makino; 14♀, Chonbuk Univ. Campus, Chonju, JB, 6-Ⅷ-1988, on *Acer saccharinum* L.; 1♀, Mujuguchondong, Muju, JB, 7-Ⅷ-1988, on *Aralia elata* Seem.; 5♀ & 3♂, Sunchang, JB, 17-Ⅵ-1989, on *Diospyros lotus* L.; 7♀ & 2♂, Chinan, JB, 2-Ⅷ-1989, on *Castanea crenata;* 9♀♀, Chonju, JB, 21-Ⅷ-1989, on *Acer negundo* L.; 11♀, Chonju, JB, 27-Ⅴ-1990, on *Sorbus alnifolia* (S. et Z.) K. Koch; 2♀, Mujuguchondong, Muju, JB, 4-Ⅷ-1990, on *Lindera obtusiloba* Bl.; 4♀, Mt. Naejang-san, Chongup, JB, 1-Ⅷ-1990, on *Lindera obtusiloba* ; 1♀, Sunchon, CN, 29-Ⅶ -1989, on *Castanea crenata;* 7♀ & 3♂, Mt. Sorak-san, GW. 26-Ⅶ-1989, on *Quercus acutissima* Caruth; 1♀ & 3♂, Mt. Sorak-san, GW, 26-Ⅶ-1989, on *Acer mono* Max.; 15♀ & 4♂, Kangrung, GW, 26-Ⅶ-1989, on *prunus serrulata* var. *spontanea;* 2♀, Kangrung, GW, 11-Ⅷ-1989, on *Ulmus davidiana* Planch. var. *japonica* Nakai; 1♂, Mt. Chiak-san, GW, 11-Ⅷ-1989, on *Castancea crenata;* 1 ♀, Chunchon, GW, 12-Ⅷ-1989, on *Ulmus davidiana* var. *japonica*; 1♀, Chunchon, GW, 12-Ⅷ-1989, on *Koelreuteria paniculata* Laxm.; 9♀ & 1♂, Chungju, CB, 7-Ⅷ-1989, on *Celtis koraiensis* Nakai; 2 ♀ & 1♂, Chungju, CB, 7-Ⅷ-1989, on *Ailanthus altissima* Swingle; 1♀, Kangwha, GG, 16-Ⅸ-1989, on *Schisandra chinensis* Bail.; 7♀, Chonan, CN, 28-Ⅸ-1989, on *Juglans sinensis* Dode; 3♀, Chonan, CN, 28-Ⅸ-1989, on *Acer pseudo-sieboldianum* (Paxton) Kom.; 10♀, Chonan, CN, 28-Ⅸ-1989, on *Aralia continentalis* Kitagawa; 3♀, Chonan, CN, 28-Ⅸ-1989, on *Viburnum sargentii* Koehne; 4♀, Sansong park, Kongju, CN, 28-Ⅸ-1989, on *Broussonetia papyrifera*(L.) Vent.; 2♀, Chinju, GN, 2-Ⅹ -1989, on *Ailanthus altissima;* 5♀, Milyang, GN, 2-Ⅹ-1989, on *Castanea crenata;* 1♀ & 1♂, Masan, GN, 30-Ⅷ-1989, on *Platycarya strobilacea* S. et Z.; 3♀, Haenam, GN, 20-Ⅶ-1991, on *Sorbus alnifolia;* 7♀, Yongdok, GB, 27-Ⅶ-1989, on *Vitis amurensis* Rupr.; 3♀, Uljin, GB, 27-Ⅶ-1989, on *Quercus mongolica* Fisch.; 9♀♀, Mt. Palgong-san, GB, 2-Ⅹ-1989, on *Platycarya strobilacea* S. et Z.; 8♀ & 2♂, Chomchon, GB, 7-Ⅷ-1989, on *Ailanthus altissima;* 3♀ & 2♂, Kimchon, GB, 7-Ⅷ-1989,

on *Prunus serrulata* var. *spontanea;* 1♀, Mt. Palgong-san, GB, 2-X-1989, on *Pueraria thunbergiana* Benth.

Distributions. Korea, Africa, Europe, India, Indonesia, Japan, Lebanon, North America, South America, the former U.S.S.R.

Remarks. *A. finlandicus* was collected from diverse plants and is comopolitan. This species was collected on *Acer saccharinum* together with spider mite, *Oligonychus aceris* (Shimer).



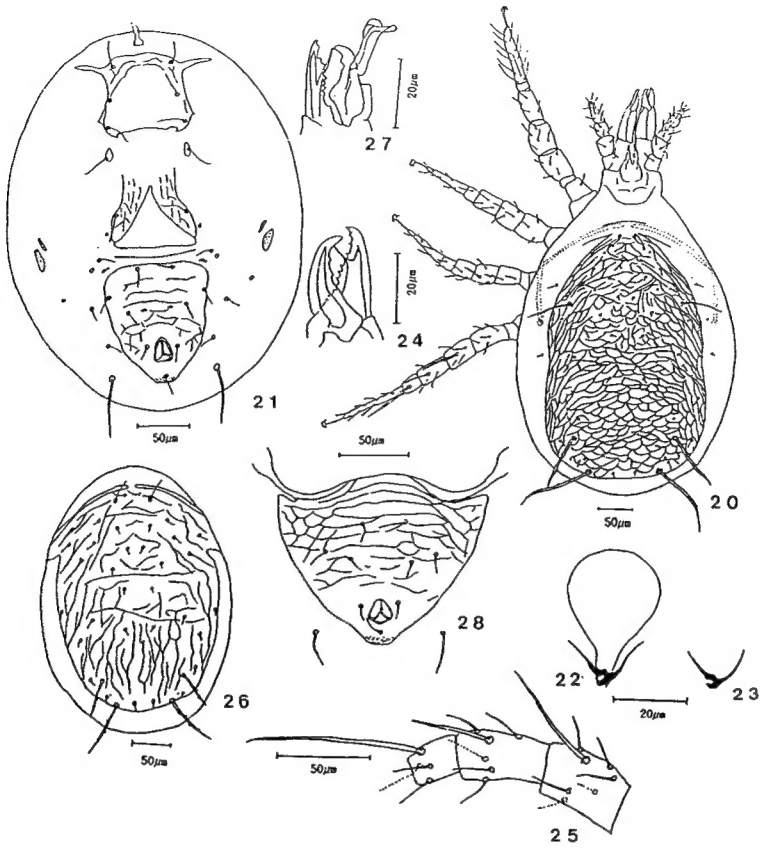
Figs. 11-19. *Amblyseius finlandicus* (Oudemans). 11. dorsum(♀); 12, sternal shield(♀); 13, posterior ventral surface(♀); 14, spermatheca; 15, chelicera(♀); 16. genu, tibia, and basitansus of leg Ⅵ(♀); 17, dorsum of idiosoma(♂); 18, chelicera(♂); 19, ventrianal shield(♂).

***Amblyseius* (*Amblyseius*) *rademacheri* Dosse 북방이리응애 (Figs. 20-28)**

Amblyseius rademacheri Dosse, 1958, p. 44, figs. 1-5; Ehara, 1959, p. 288, figs. 6-11; Ryu and Ehara, 1992, p. 727-729, figs. 15-23.

Amblyseius (*Amblyseius*) *rademacheri* Dosse: Ehara, 1966, p. 23; Ehara, 1977, p. 37; Ehara, 1980, p. 65, fig. 20-D.

Typhlodromips rademacheri Dosse: Moraes *et al.*, 1986, p. 145.



Figs. 20-28. *Amblyseius rademacheri* Dosse. 20. dorsum(♀); 21, venter of idiosoma(♀); 22-23, spermatheca; 24, chelicera(♀); 25, basitarsus, tibia, and genu of leg Ⅳ(♀); 26, dorsum of idiosoma(♂); 27, chelicera(♂); 28, ventrianal shield(♂).

Female, Dorsal shield 376 long, 239 wide at level of waist, reticulate, with at least six pairs of small pores. Setae on dorsal shield: Z5 the longest, barbed; Z4 long, barbed; s4 long, practically smooth; the remaining setae much shorter, smooth. Setae r3 and R1 on interscutal membrane, smooth. Peritreme extending to between setae j1. Sternal shield with 3 pairs of setae; metasternal platelets much longer than width, Ventrianal shield wider than genital shield, 3 pairs of preanal setae, a pair of crescentic pores. Seta JV5 smooth. 2 pairs of slender metapodal platelets. Spermatheca as figured. Fixed digit with multidentate and pilus dentilis; movable digit with 2 teeth. Chaetotaxic formula: gunu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1, 2/0-1, Leg Ⅳ with 3 tapering macrosetae. Lengths of setae(n=10, mean); j1 25.0, j3 35.1, j4 7.4, j5 6.4, j6 8.2, J2 9.3, J5 9.0, z2 15.3, z4 12.8, z5 7.0, Z1 10.1, Z4 90.6, Z5 118.9, s4 64.4, S2 13.7, S4 11.5, S5 10.6, r3 16.7, R1 8.4, JV5 49.8, macrosetae on leg Ⅳ: genu 60.9, tibia 46.3, basitarsus 94.7.

Male. Setae r3 and R1 on dorsal shield. Peritreme extending to between setae j1. Ventrianal shield fused with peritrematal shield; 3 pairs of preanal setae; a pair of pores. Chelicera with 6 teeth and pilus dentilis on fixed digit; mobable digit unidentate. Spermatodactyl as figured. Lengths of setae(n

=3, mean); j1 21.3, j3 31.3, j4 6.3, j5 5.3, j6 7.0, J2 7.3, J5 7.0, z2 10.7, z4 10.0, z5 6.3, Z1 7.7, Z4 56.3, Z5 77.0, s4 39.3, S2 12.7, S4 10.0, S5 9.3, r3 15.3, R1 8.3, JV5 30.3, macrosetae on leg Ⅳ: genu 44.7, tibia 35.7, basitarsus 80.7.

Specimens examined. 26♀ & 3♂, Yonchon, GG, 16-Ⅸ-1989, on *Ambrosia trifida L.*: 2♀, Yochon, GG, 16-Ⅸ-1989, on *Rubus crataegifollus* Bunge; 1♀, Yonchon, GG, 16-Ⅸ-1989, on *Castanea crenata* S. et Z.

Distributions. Korea, Europe, Japan, the former U.S.S.R.

Remarks. This species was previously recorded from Europe, Japan, and the former U.S.S.R.

***Amblyseius* (*Amblyseius*) *obtuserellus* Wainstein et Begljarov 과립이리응애 (Figs. 29-34)**

Amblyseius obtuserellus Wainstein et Begljarov, 1971, p. 1806, fig. 3.

Amblyseius(*Amblyseius*) *obtuserllus* Wainstein et Begljarov: Ehara and Yokogawa, 1977, p. 54-57, figs. 25-31; Ryu and Lee, 1992, p. 27-28, figs, 16-21.

Female. Dorsal shield 352 long, 227 wide at level of waist; smooth, with at least six pairs of small pores. Setae on dorsal shield: Z5 the longest, tapering; Z4 and s4 long, tapering; j3 longer than j1; the remaining setae shorter, smooth. Setae r3 and R1 on interscutal membrane, smooth. Peritreme extending to between setae j1. Sternal shield with 3 paris of setae; metasternal platelets much longer than width. Ventrianal shield wider than genital shield; with 3 pairs of preanal setae, a pair of pores. Seta JV5 smooth. 2 pairs of slender metapodal platelets. Cervix of spermatheca cylindrical, slightly dilated proximally, the sides granular externally. Fixed digit with multidentate and pilus dentilis; movable digit with 3 teeth. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1. 2/0-1. Leg Ⅳ with 3 tapering macrosetae. Lenths of setae(n=5, mean); j1 32.4, j3 49.6, j4 6.0, j5 5.6, j6 5.8, J2 7.0, J5 9.8, z2 10.6, z4 8.6, z5 5.4, Z1 8.5, Z4 111.0, Z5 218.4, s4 81.0, S2 10.0, S4 9.6, S5 9.4, r3 14.8, R1 8.4, JV5 77.0 macrosetae on leg Ⅳ: genu 100.4, tibia 68.8, basitarsus 79.0.

Male. Not GNow.

Specimens examined. 1♀, Chonbuk Univ. Campus, Chonju JB, 6-Ⅷ-1987, on *Pinus figida* Mill.; 1♀, Mujuguchondong, Muju, JB, 7-Ⅷ-1988, on *Pinus koraiensis* S. et Z.; 1♀, Sunchon, JN, 20-Ⅶ-1989, on *bamboo;* 3♀, Yongdok, GB, 27-Ⅶ-1989, on *Vitis amurensis* Rupr.

Distributions. Korea, Japan, the former U.S.S.R.

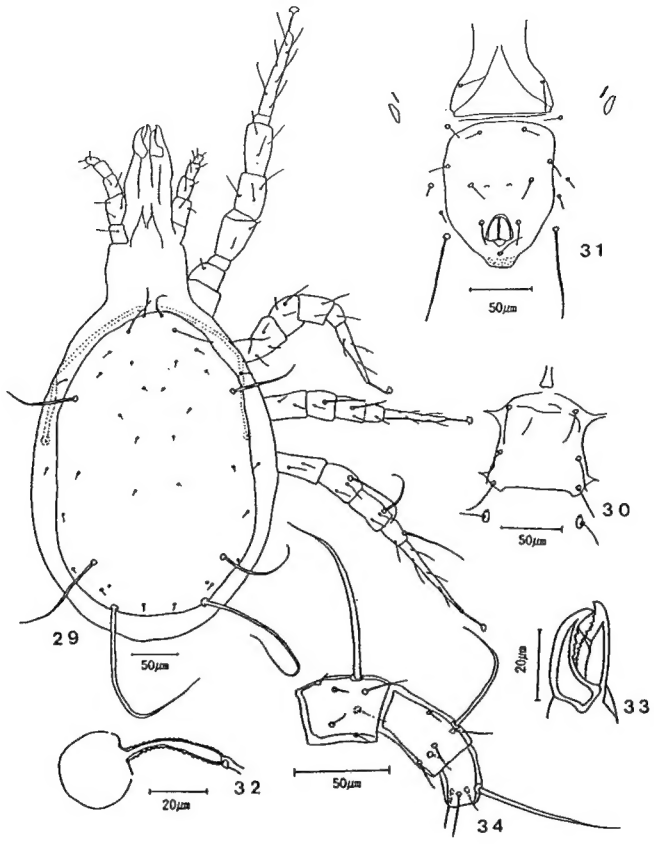
Remarks. *A. obtuserellus* was GNown from the Primorsky territory, the former U.S.S.R. (Wainstein and Begljarov, 1971), but was redescribed with the Japanese specimens by Ehara (1977). This species is characteristic in the cervix of spermatheca long, the side granular externally.

***Amblyseius* (*Amblyseius*) *koreaensis* Denmark et Muma 민무늬이리응애**

Amblyseius koreaensis Denmark et Muma 1989, p. 108-109, figs. 576-580.

Distributions. Korea.

Remaks. *A. koreaensis* was collected on medicinal plants from Korea and described by Denmark and Muma(1989), but author could not collect this species. Setal lengths described in original paper (n=1): j1 29, j3 46, j4 6, j5 6, j6 6, J2 6, J5 9, z2 9, z4 8, z5 6, Z1 11, Z4 93, Z5 196, s4 74, S2 11, S4 9, S5 9, r3 14, R1 6, macrosetae on leg Ⅳ; genu 80, tibia 50, basitarsus 67.



Figs. 29-34. *Amblyseius obtuserellus* Wainstein et Begljarov 29, dorsum(♀); 30, sternal shield(♀); 31, posterior ventral surface(♀); 32, spermatheca; 33, chelicera(♀); 34. genu, tibia, and basitarsus of legs Ⅳ(♀)

***Amblyseius* (*Amblyseius*) *eharai* Amitai et Swirski 긴꼬리이리응애(Figs. 35-44)**

Amblyseius ehari Amitai et Swirski, 1981, p. 60, figs. 1-3, 6-8, 12, 13.

Amblyseius(*Amblyseius*) *deleoni* Muma et Denmark: Ehara, 1977, p. 34; Lee and Ryu, 1989, p. 216-219, fig. 1A-H.

Amblyseius (*Amblyseius*) *eharai* Amitai et Swirski: Ryu and Ehara, 1990, p. 147-148, figs. 10-12.

Female. Dorsal shield 374 long, 236 wide at level of waist; smooth, with at least 4 pairs of small pores. Setae on dorsal shield: Z5 the longest, slightly batbed and tapering; Z4 and s4 long, tapering; j3 longer than j1; the remaining setae shorter, smooth. Setae r3 and R1 on intersuctal membrane, smooth. Peritreme extending to seta j1. Sternal shield with posterior margine not straight, with 3 paris of setae; metasternal platelets roundish. Ventrianal shield wider than genital shield; with 3 paris of preanal setae, a pair of pores. Seta JV5 smooth. 2 paris of slender metapodal platelets. Spermatheca as figured. Fixed digit with multidentate and pilus dentilis; mobable digit with 4 teeth. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1. 2/0-1. Leg Ⅳ with 3 tapering macrosetae. Lengths of setae(n=10, mean): j1 33.9, j3 45.5, j4 6.5, j5 4.0, j6 7.6, J2 8.0, J5 8.3, z2

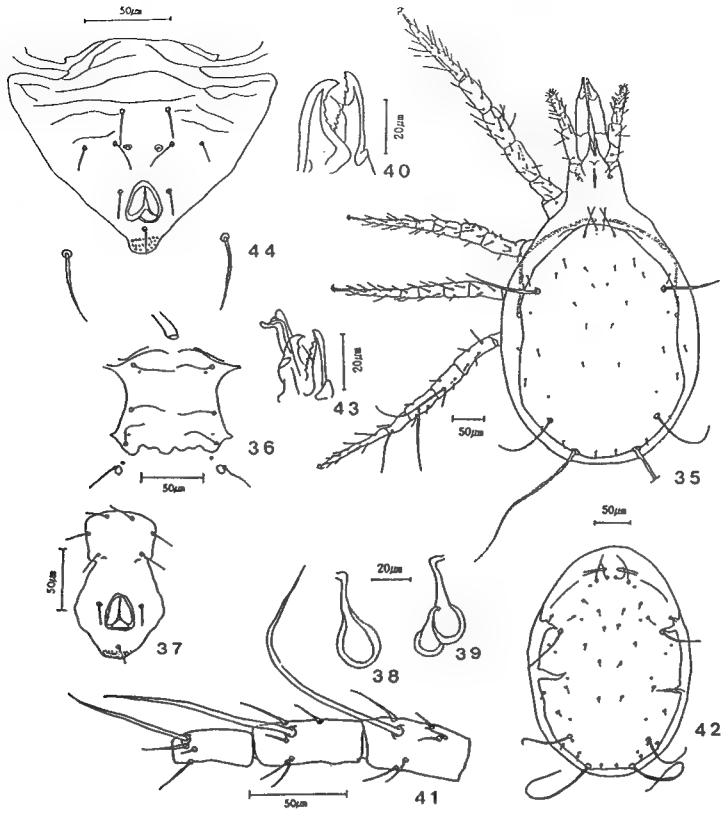
10.8, z4 8.4, z5 4.5, Z1 8.3, Z4 106.5, Z5 248.4, s4 96.3, S2 12.6, S4 10.8, S5 8.4, r3 15.9, R1 8.9, JV5 58.9, macrosetae on leg Ⅳ: genu 115.4, tibia 87.6, basitarsus 68.0.

Male. Setae r3 and R1 on dorsal shield. Peritreme extending to seta j1. Ventrianal shield fused with peritrematal shield; 3 pairs of preanal satae, a pair of pores. Chelicera with multidentate and pilus dentilis on fixed digit; mobable digit unidentate. Spermatodactyl as figured. Length of setae(n=10, mean): j1 27.9, j3 42.7, j4 6.1, j5 4.7, j6 7.2, J2 7.2, J5 6.9, z2 10.8, z4 7.0, z5 4.6, Z1 7.8, Z4 77.3, Z5 178.2, s4 79.0 S2 10.4, S4 8.3, S5 6.6, r3 14.9, R1 7.7. JV5 36.5, macrosetae on leg Ⅳ: genu 72.0, tibia 60.2, basitarsus 36.5.

Specimens examined. 2♀, Samnye, Wanju, JB, 30-Ⅶ-1987, on *Chamaecyparis pisifora* (S. et Z.) var. *filifera* Mast.; 2♀, Chonju, JB, 3-Ⅷ-1987, on *Chamaecyparis pisifera* (S. et Z.) Endl.; 1♀, Soyang, Wanju, JB, 4-Ⅷ-1987, on *Juniperus rigida* S. et Z.; 6♀ & 2♂, Soyang, Wanju, JB, 19-Ⅸ-1987, on *Acer saccharinum* L.; 1♀ & 1♂, Chonju, JB, 5-Ⅵ-1988, on *Kalopanax pictus* (Thunb.) Nakai; 2♀, Kui, Wanju, JB, 6-Ⅵ-1988, on *Prunus serrulata* Lindley var. *spontanea* (Maxim.) Makino; 3♀ & 3♂, Chonju, JB, 16-Ⅵ-1988, on *Persicaria hydropiper* (L.) Spach; 4♀ & 1♂, Chonju, JB. 24-Ⅵ-1988, on *Humulus japonicus* S. et Z.; 5♀ & 2♂, Iri, JB, 7-Ⅶ-1988, on *Styrax obassia S.* et Z.; 10♀ & 3♂, Iri, JB, 14-Ⅶ-1988, on *Korria Japonica* (L.) Dc.; 6♀, Chonju JB, 17-Ⅶ-1988, on *Cudrania tricuspidata* Bureau; 1♀ & 1♂, Chonju JB, 17-Ⅶ-1988, on *Aralia elata* Seem.; 7♀ & 9♂. Iri, JB, 24-Ⅶ-1988, on *bamboo*; 5♀, Chonju, JB, 1-Ⅷ-1988, on *Hibiscus syriancus* L.: 17♀♀ & 1♂, Soyang, Wanju, JB, 9-Ⅷ-1988, on *Thuja orientalis* L.; 5♀ & 1♂, Mt. Sonun-san, Kochang, JB, 17-Ⅷ-1988, on *Carpinus cordata* Bl.; 1♀ & 1♂, Unam, Imshil, JB, 24-Ⅷ-1988, on *Diospyros lotus* L.; 9♀, Unam, Imshil, JB, 24-Ⅷ-1988, on *Viburnum wrightii* Miq.; 6♀, Soyang, Wanju, JB, 11-Ⅹ-1988, on *Abies holophylla* Max.; 7♀ & 4♂, Taeya, Okgu, JB, 3-Ⅵ-1989, on *Juglans sinensis* Dode; 13♀ & 5♂, Soyang, Wanju, JB, 6-Ⅵ-1989, on *Firmiana simplex* W.F. Wight; 3♀ & 1♂, Sunchang, JB, 17-Ⅵ-1989, on *Styrax japonica* S. et Z.; 4♀ & 2♂, Kyokpo, Puan, JB, 27-Ⅷ-1989, on *Platycarya strobilacea* S. et Z.; 2♀ & 2♂, Chonju, JB, 8-Ⅶ-1990, on *Diospyros kaki* Thunb.; 1♀, Is. Sonyu-do, JB, 14-Ⅷ-1990, on *Alnus hirsuta* (Spach) Rupr.; 9♀, Is. Sonyu-do, JB, 4-Ⅹ-1990, on *Hydrangea macrophylla* for. *otaksa*(S. et Z.) Wils.; 2♀, Chonju, JB, 7-Ⅷ-1992, on *Boehmeria spicata* Thunb.; 4♀ & 1♂, Mt. Wolchul-san, Yongam, JN, 29-Ⅵ-1989, on *Alangium platanifolium* var. *macrophylum* (S. et Z.) Wanger; 11♀, Sunchon, JN, 20-Ⅶ-1989, on *Castanea crenata* S. et Z.; 4♀, Suchon, JN, 20-Ⅶ-1989, on *Rhus verniciflua* Stokes; 2♀, Kimchon, GB, 7-Ⅷ-1989, on *Ailanthus altissima* Swingle; 10♀ & 1♂ Kangwha, GG, 16-Ⅸ-1989, on *Magnolia kobus* A.P. Dc.; 7♀, Ungchon, Poryong, CH, 20-Ⅶ-1989, on *Juglans sinensis;* 7♀ & 2♂, Chonan, CN, 28-Ⅸ-1989, on *Acer pseudo-sieboldianum* (Paxton) Kom.; 5♀ & 2♂, Chonan, CN, 28-Ⅸ-1989, on *Viburnum sargentii* Koehne; 1♀, Sansong park, Kongju, CN, 28-Ⅸ-1989, on *Broussonetia papyrifera* (L.) Vent.; 6♀ & 5♂, Milyang, GN, 2-X-1989, on *Ailanthus altissima;* 1♀, Mt. Palgong-san, GB, 2-X-1989, on *Pueraria thunbergiana* Benth.; 3♀ & 2♂, Haenam, GN, 20-Ⅶ-1991, on *Vitis amurensis* Rupr.

Distributions. Korea, Hong Kong, Japan.

Remarks. *A. eharai* was collected from diverse plants. This species was collected on *Humulus japonicus* together with spider mite, *Tetraychus urticae* Koch and on *Firmiana simplex* W.F. Wight with *Aponychus firminae* Ma et Yuan.



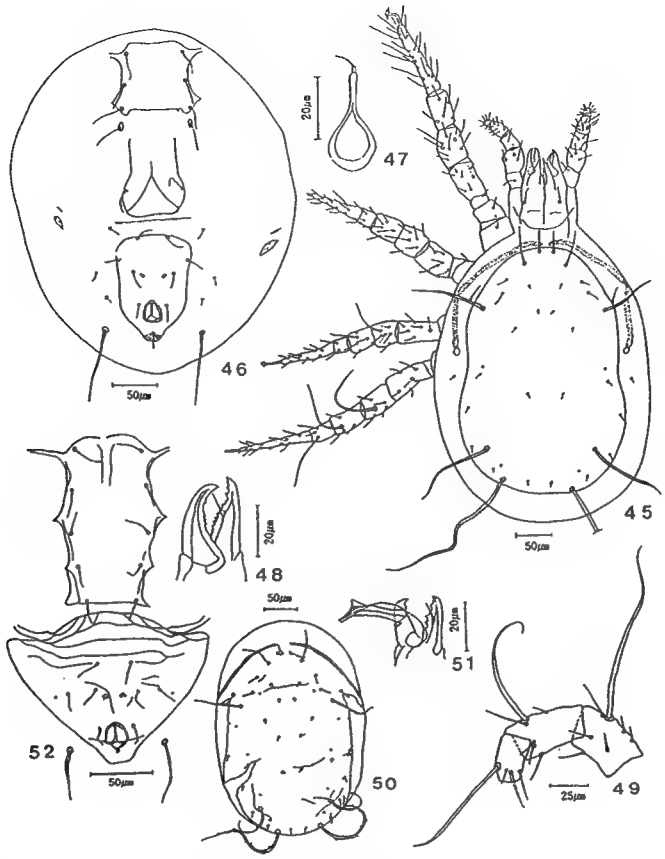
Figs. 35-44. *Amblyseius eharai* Amitai et Swirski. 35, dorsum(♀); 36, sternal shield(♀); 37, ventrianal shield(♀); 38-39, spermatheca; 40, chelicera(♀), 41, basitarsus, tibia, and genu of leg Ⅳ(♀); 42, dorsum of idiosoma(♂); 43, chelicera(♂); 44, ventrianal shield(♂).

***Amblyseius* (*Amblyseius*) *orientalis* Ehara 동양이리응애 (Figs. 45-52)**

Amblyseius orientalis Ehara, 1959, p. 291, figs. 14-16; Ehara, 1962, p. 53-54, figs. 1-5.

Amblyseius(*Amblyesius*) *orientalis* Ehars, 1975, p. 28, 30, fig. 8: Ehara, 1977, p. 37; Lee and Ryu, 1989, p. 219-221, fig. 2A-G; Ryu and Ehara, 1990. p, 148, fig. 14.

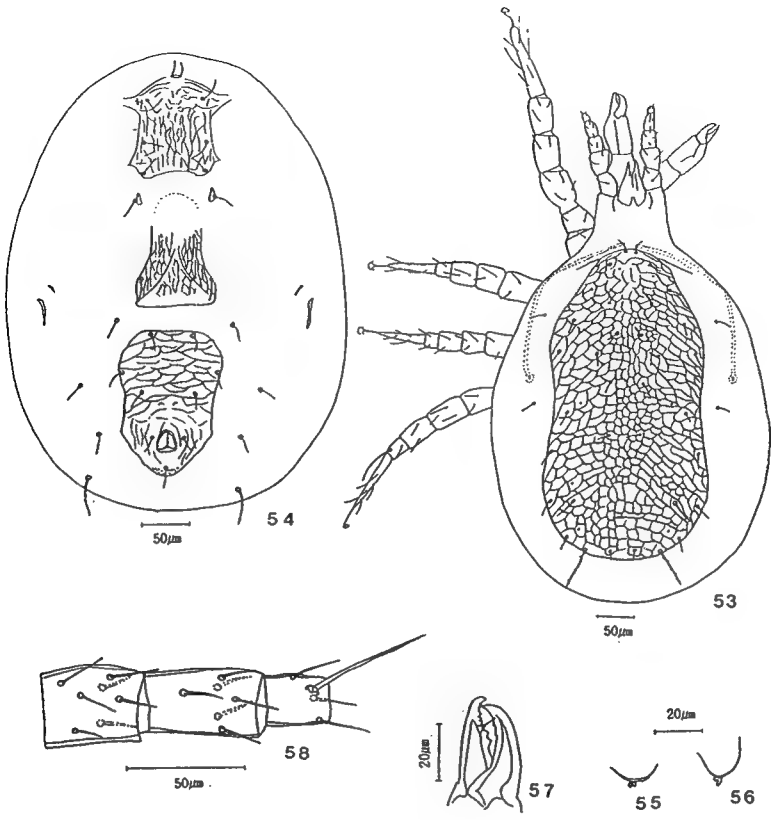
Female. Dorslal shield 386 long, 220 wide at level of waist. Dorsal shield smooth, with at least 5 pairs of small pores. Seate on dorsal shield; Z5 the longest, slightly batbed, tapering; Z4 and s4 long, tapering, slightly barbed; j3 longer than j1: the remaining setae shorter, smooth. Setae r3 and R1 on interscutal membrane, smooth. Peritreme extending to between setae j1. Sternal shield with 3 pairs of setae; metasternal platelets longer than width. Ventrianal shield wider than genital shield; with 3 paris of preanal setae, a pair of pores. Seta JV5 smooth. 2 paris of slender metapodal platelets. Spermatheca as figred. Fixed digit with multidentate and pilus dentilis; movable digit with 4 teeth. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1. 2/0-1. Leg Ⅳ with 3 tapering macrosetae. Lengths of setae(n=10, mean): j1 32.0, j3 51.5, j4 6.5, j5 4.4, j6 6.4, J2 6.4, J5 7.2, z2 13.1, z2 17.0, z4 4.5, Z1 7.2, Z4 115.6, Z5 234.3, s4 96.3, S2 9.5, S4 7.9, S5 8.0, r3 19.6, R1 8.6, JV5 80.7, macrosetae on leg Ⅳ: genu 115.8, tibia 83.6, basitarsus 75.0.



Figs. 45-52. *Amblyseius orientalis* Ehara. 45, dorsum(♀); 46, venter of idiosoma(♀); 47, spermatheca; 48, chelicera(♀); 49, basitarsus, tibia, and genu of leg Ⅳ(♀); 50, dorsum of idiosoma(♂); 51, chelicera (♂); 52, venter of idiosoma(♂).

Male. Setae r3 and R1 on dorsal shield. Peritreme extending to seta j1. Ventrianal shield fused with peritrematal shield; 3 pairs of preanal setae, a pair of pores. Chlicera with 5 teeth and pilus dentilis on fixed digit; movable digit unidentate. Spermatodactyl as figured. Lengths of setae(n=3, mean): j1 25.9, j3 4.20, j4 6.8, j5 4.6, j6 7.9, J2 8.0, J5 6.9, z2 11.2, z4 14.7, z5 5.7, Z1 8.6, Z4 78.8, Z5 152.8, s4 69.7, S2 9.8, S4 7.9, S5 8.0, r3 15.5, R1 8.4, JV5 45.7, macrosetae on leg Ⅳ: genu 59.6, tibia 47.1, basitarsus 53.4.

Specimens examined. 2♀, Chonbuk Univ. Campus, Chonju, JB, 11-Ⅷ-1987, on *Abies holophylla* Max.; 6♀ & 3♂, Soyang, Wanju, JB, 16-Ⅸ-1987, on *Firmiana simplex* W.F. Wight; 3♀, Kwanchon, Imshil, JB, 23-Ⅶ-1988, on *Zelkova serrata* Makino; 4♀, Kwanchon Imshil, JB, 23-Ⅶ-1988, on *Celtis sinensis* Pers.; 11♀ & 3♂, Mt. Sonun-san, Kochang, JB, 19-Ⅷ-1988, on *Platycarya strobilacea* S. et Z.; 1♀, Mt. Sonun-san, Kochang, JB, 19-Ⅷ-1988, on *Carpinus tschonoskii Max.*; 1♀, Mt. Sonun-san, Kochang, JB, 19-Ⅷ-1988, on *Meliosma myriantha* S. et Z.; 1♀, Mt. Sonun-san, Kochang, JB, 19-Ⅷ-1988, on *Fraxinus rhynchophylla* Hance; 3♀, Mt. Sonun-san, Kochang, JB, 19-Ⅷ-1988, on *Carpinus cordata* Bl.; 1♀, Mujuguchondong, Muju, JB, 4-Ⅶ-1990, on *Ulmus davidiana*



Figs. 53-58. *Amblyseius koyamanus* Ehara. 53, dorsum(♀); 54, venter of idiosoma(♀); 55-56, spermatheca; 57, chelicera(♀); 58, genu, tibia, and basitarsus of leg Ⅳ(♀).

Planch. var. *japonica* Nakai; 19♀ & 4♂, Mt. Sonun-san, Kochang, JB, 25-Ⅶ-1990, on *Castanea crenata* S. et Z; 2♀, Chonan, CN, 28-Ⅸ-1989, on *Acer pseudo-sieboldianum* (Paxton) Kom.; 3♀, Chinju, GN, 2-Ⅹ-1989, on *Prunus serrulata* Lindley var. *spontanea*(Maxim.) Makino.

Distribution. Korea. Japan.

Remarks. *A. orientalis* was collected on *Castanea crenata* together with spider mite, *Oligonychus* sp. and on *Ables holophylla* Max. with *Oligonychus ununguis* (Jacobi).

***Amblyseius* (*Amblyseius*) *koyamanus* Ehara et Yokogawa 줄무늬이리응애 (figs. 53-58)**

Amblyseius (*Amblyseius*) *koyamanus* Ehara et Yokogawa, 1977, p. 50-52, figs. 1-8; Ehara, 1977, p. 36; Ehara, 1985, p. 118, figs. 13-14; Ryu and Lee, 1992, p. 24-27, figs. 10-15.

Female. Dorsal shield 406 long, 194 wide at level of waist. Dorsal shield reticulate, with at least 4 pairs of small pores. Setae on dorsal shield: Z5 the longest, barbed; Z4 sparsely barbed; the remaining setae shorter, smooth. Setae r3 and R1 interscutal membrane, smooth. Peritreme extending to seta j1. Sternal shield distrinctly reticulate, with 3 pairs of setae; metasternal platelets much longer than width, Ventrianal shield wider than genital shield; with 3 pairs of preanal setae, a pair of pores.

Seta JV5 smooth. 2 pairs of slender metapodal platelets. Spermathca with cervix semicircular or cupped. Fixed digit with multidentate and pilus dentilis; movable digit with 2 teeth. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1. 2/0-1, Leg Ⅳ with a macroseta on basitarsus. Lengths of setae(n=2, mean): j1 19.0, j3 22.5, j4 15.0, j5 15.0, j6 15.5, J2 19.5, J5 14.0, z2 20.0, z4 19.0, z5 15.0, Z1 19.5, Z4 33.5, Z5 55.5, s4 25.0, S2 25.5, S4 26.0 S5 24.0, r3 22.5 R1 21.5, JV5 35.5, macroseta on basitarsus Ⅳ 56.5.

Male. Not known.

Specimens examined. 2♀, Kunsan, JB, 23-Ⅳ-1988, on *Althaea rosea* Cav.

Distribtuions. Korea, Japan.

Remarks. Previously *A. koyamanus* was known from Japan. This species was collected on *Althaea rosea* toghether with spider mite, *Tetranychus urticae* Koch.

***Amblyseius* (*Amblyseius*) *quaesitus* Wainstein et Begljarov 비늘이리응애 (Figs. 59-67)**

Amblyseius quaesitus Wainstein et Begljarov, 1971, p. 1810, fig. 7.; Ryu and Ehara, 1991, p. 23-30, figs, 19-27.

Amblyseius(*Amblyseius*) *repletus* Wu et Li, 1985, p. 268, figs. 1-5. syn. nov.

Female. Dorsal shield 313 long, 200 wide at level of waist. Dorsal shield imbricate, with at least 4 pairs of small pores. Setae on dorsal shield: Z5 the longest, barbed; the remaining setae shorter, smooth. Setae r3 and R1 on interscutal membrane, smooth. Peritreme extending to seta j1. Sternal shield with posterior margin straight or slightly concave, with 3 pairs of setae; metasternal platelets much longer than width. Ventrianal shield approximately pentagonal, wider than genital shield; with 3 pairs of preanal setae, a pair of pores. Seta JV5 smooth. Two pairs of metapodal platelets. Spematheca as figured. Chelicera with 8 teeth and pilus dentilis on fixed digit; movable digit with 2 teeth. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1. 2/0-1. Leg Ⅳ with 3 blunt macrosetae. Lengths of setae(n=10, mean): j1 19.4, j3 19.0, j4 13.2, j5 14.2, j6 13.9, J2 16.4, J5 10. 3, z2 16.1, z4 17.4, z5 12.9, Z1 16.3, Z4 24.6, Z5 72.6, s4 19.9, S2 17.6, S4 15.9, S5 15.6, r3 16.5, R1 15.5, JV5 25.5, macrosetae on leg Ⅳ: genu 10.8, tibia 16.7, basitarsus 31.7.

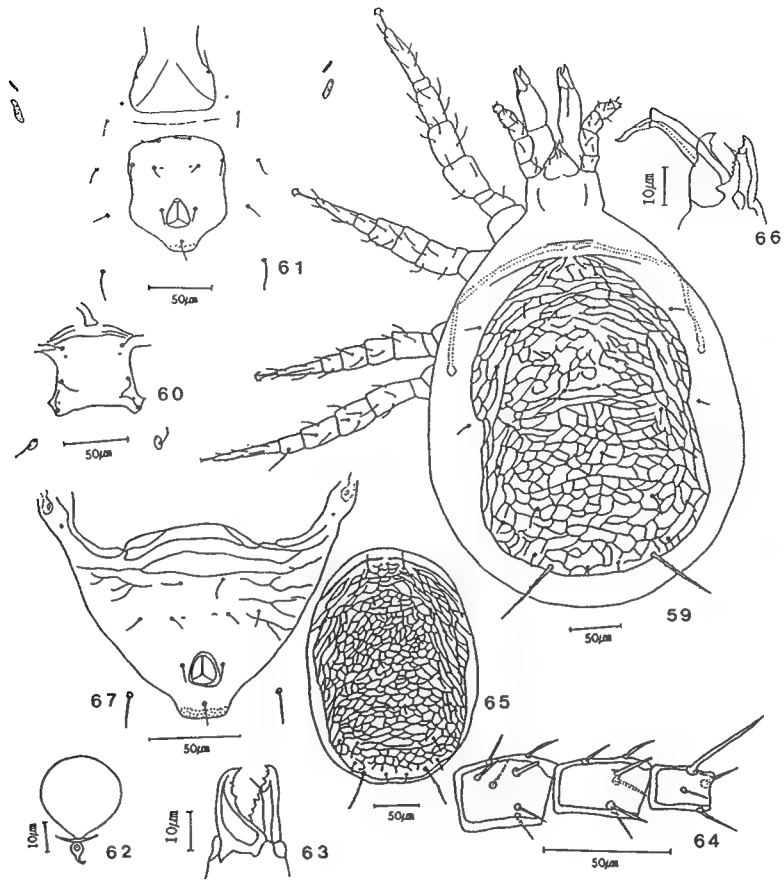
Male. Setae r3 and R1 on dorsal shield, Peritreme extending to seta j1. Ventrianal shield fused with peritrematal shield, with 3 pairs of preanal setae; a pair of pores. Chelicera with 7 teeth and pilus dentilis on fixed digit; movable digit unidentate. Spermatodactyl as figured. Lengths of setae(n=10, mean): j1 17.7, j3 19.7, j4 10.5, j5 10.1, j6 10.7, J2 11.4, J5 9.1, z2 11.7. z4 14.9, z5 10.2, Z1 11.2, Z4 20.8, Z5 50.3 s4 15.9, S2 13.1, S4 11.8, S5 12.5, r3 14.2, R1 11.4, JV5 19.0, macrosetae on leg Ⅳ; 27. 6, genu 8.9, tibia 14.4, basitarsus

Specimens examined. 3♀ & 5♂, Mt. Sonun-san, Kochang, JB, 19-Ⅷ-1988, on *Castanea crenata* S. et Z.; 2♀, Mt, Sonun-san, Kochang, JB, 19-Ⅷ-1988, on *Meliosma myriantha* S. et Z.: 2♀, Mt. Sonun -san, Kochang, JB, 25-Ⅶ-1990, on *Carpinus tschonoskii* Maxim.; 1♂, Mt. Sonun-san, Kochang, JB, 25-Ⅶ-1990. on *Corylus heterophylla* Fisch.; 3♀ & 4♂, Mt. Sonun-san, Kochang, JB, 25-Ⅶ-1990, on *Prunus serulate* Lindley var. *spontanea*(Maxim.) Makino.

Distributions. Korea, China, the former U.S.S.R.

Remarks. *A. quaesitus* was previously recorded from the former U.S.S.R. and recorded as *A.*(*A.*)

repletus by Wu and Li (1985) from China.



Figs. 59-67. *Amblyseius quaesitus* Wainstein et Begljarov. 59, dorsum(♀); 60, sternal shield(♀); 61, posterior ventral surface(♀); 62, spermatheca; 63, chelicera(♀); 64, genu, tibia, and basitarsus of leg Ⅳ(♀); 65, dorsum of idiosoma(♂); 66, chelicera (♂); 67, ventrianal shield(♂).

***Amblyseius* (*Amblyseius*) *okinawanus* Ehara 남방이리응애 (Figs. 68-76)**

Amblyseius (*Amblyseius*) *okinawanus* Ehara, 1967a, p. 72, figs. 17-24; Ehara, 1972, p. 156; Ehara, 1975, p. 30; Ehara, 1977, p. 37; Ehara, 1980, p. 63, fig, 19-D; Ehara and Hamaoka, 1980, p. 6-7, figs, 9-11; Ryu and Lee, 1992, p. 27-30, figs. 22-30.

Female. Dorsal shield 336 long, 205 wide at level of wasit. Dorsal shield reticulate along both lateral margin, with at least 5 pairs of small pores on proscutum. Setae on dorsal shield: Z5 the longest, barbed, stout; Z4 silightly barbed; The remaining setae shorter, smooth. Setae r3 and R1 on intersuctal membrane, smooth. Peritreme exteding to between setae j1. Sternal shield with 3 pairs of setae; metasternal platelets much longer than width. Ventrianal shield wider than genital shield; with 3 pairs of preanal setae, a pair of pores. Seta JV5 smooth. 2 pairs of slender metapodal platelets. Spermatheca as figured. Fixed digit with multidentate and pilus dentilis; movable digit with 3 teeth. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1, 2/0-1. Leg Ⅳ three macrosetae.

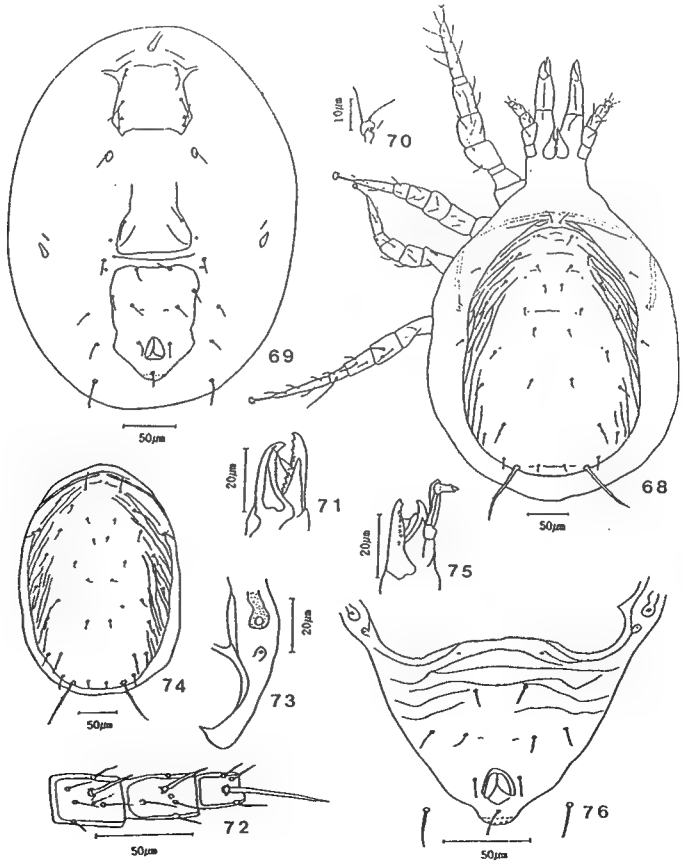
Lengths of setae(n=7, mean): j1 20.4, j3 15.7, j4 9.1, j5 9.4, j6 11.6, J2 14.7, J5 8.7, z2 13.7, z4 14.9, z5 10.6, Z1 14.3, Z4 33.4 Z5 79.9, s4 20.1, S2 18.4, S4 16.7, S5 17.6, r3 13.4, R1 11.0, JV5 27.7, macrosetae on leg Ⅳ: genu 25.0, tibia 24.6, basitarsus 55.6.

Male. Setae r3 and R1 on dorsal shield. Pertreme extending to seta j1. Ventrianal shield fused with peritrematal shield; 3 pairs of preanal setae, a pair of pores. Chelicarea with 8 teeth and pilus dentilis on fixed digit; movable digit unidentate. Spermatodactyl as figured. Lengths of setae(n=4, mean); j1 17.8, j3 18.8, j4 9.3, j5 8.5, j6 10.0, J2 11.0, J5 7.0, z2 13.8, z4 14.5, z5 9.0, Z1 11.8, Z4 27.0, Z5 56. 3, s4 18.0 S2 18.0 S4 15.5, S5 17.0, r3 10.3, R1 10.0, JV5 22.3, macrosetae on leg Ⅳ: genu 20.8, tibia 21.5, basitarsus 47.5.

Specimens examined. 2♀ & 1♂, Mt. Sonun-san, Kochang, JB, 25-Ⅶ-1990, on *Boehmeria spicata* Thunb.; 7♀ & 3♂, Mt. Sonun-san, Kochang, JB, 12-Ⅶ-1990, on *Boehmeria spicata*.

Distributions. Korea, Hong Kong, Japan, Thailand.

Remarks. Previously *A. okinwanus* was known from Hong Kong, Japan, and Thailand.

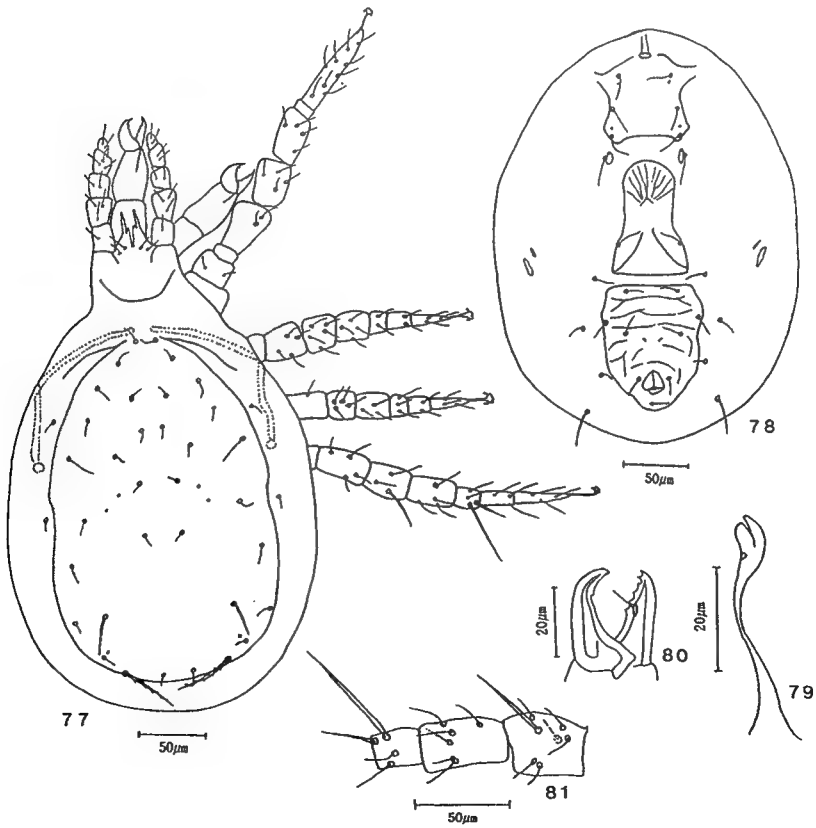


Figs. 68-76. *Amblyseius okinawanus* Ehara. 68, dorsum(♀); 69, venter of idiosoma(♀); 70, spermatheca; 71, chelicera(♀); 72, genu, tibia, and basitarsus of leg Ⅳ(♀); 73, peritrematal shield(♀); 74, dorsum of idiosoma(♂); 75, chelicera(♂); 76, ventrianal shield(♂).

***Amblyseius* (*Amblyseius*) *makuwa* Ehara 알락이리응애(신청) (Figs. 77-81)**

Amblyseius (*Amblysrius*) *makuwa* Ehara. 1972. p. 154-156, figs. 70-74; Ehara, 1975, p. 29; Ehara, 1977, p. 36.

Female. Body lightly brown in colour. Idiosoma 380 long. 275 wide at level of R1; Dorsal shield 350 long, 210 wide at level of waist. Dorsal shield smooth. Setae on dorsal shield: Z5 the longest, barbed; Z4 as long as s4; the remaining setae short, smooth. Setae r3 and R1 on interscutal membrane, smooth. Pertreme externding to seta j1; pertitrematal shield fused anteriorly with dorsal shield. Sternal shield with 3 pairs of setae; metasternal platelets much longer than width, the posterior pair much larger. Ventrianal shield longer than width, wider than genital shield, with lateral margins slightly concave or straight. 3 pairs of preanal setae on ventrianal shield; a pair of pores between and slightly behind two setae of JV2. 4 pairs of setae on membrane surrounding ventrianal shield; seta JV5 smooth. 2 pairs of slender metapodal platelets. Spermatheca as figured. Fixed digit with 5 teeth and pilus demtilis; movable digit unidentate. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1. 2/0-1. Leg Ⅳ with 3 tapering macrosetae, 1 macroseta on genu, and 2 macrosetae on basitarsus. Lengths of setae(n=2, mean). j1 19.0, j3 21.0, j4 10.5, j5 10.5, j6 11.0, J2 12.0, J5 9.5, z2 15.5, z4 16.0, z5 11.0, Z1 14.0, Z4 38.0, Z5 56.5, s4 30.0, S2 19.5, S4 15.5, r3 16.0, R1



Figs. 77-81. *Amblyseius makuwa* Ehara. 77, dorsum(♀); 78, venter of idiosoma(♀); 79, spermatheca; 80, chelicera(♀); 81, basitarsus, tibia, and genu of leg Ⅳ(♀)

15.0, JV5 35.5, macrosetae on leg Ⅳ: genu 46.0, basitarsus 64.0 and 35.5.

Male. Not known.

Specimens examined. 1♀, Iri, JB, 14-Ⅶ-1988, on *Korria japonica* (L.) Dc.; 1♀. Chonju, JB, 16-Ⅸ-1990, on *Oxalis corniculata* L.

Distributions. Korea, Japan.

Remark. *A. makuwa* has two macrosetae on basitarsus Ⅳ. This species was previously recorded from Japan and is recorded for the first time in Korea. The Korean specimens accord generally with Ehra's description and illustration (1972) of Japaneses specimen.

***Amblyseius* (*Amblyseius*) *oguroi* Ehara 돌이리응애 (Figs. 82-90)**

Amblyseius oguroi Ehara, 1964, p. 384-386, figs, 17-23.

Amblyseius (*Amblyseius*) *oguroi* Ehara, 1975, p. 29; Ehara, 1977, p. 37; Ryu and Lee, 1992, p. 23-25, figs. 1-9.

Female. Dorsal shield 337 long, 202 wide at level of waist; reticulate along lateral margins, with at least 4 pairs of small pores. Setae on dorsal shield: Z5 the longest, barbed, stout; Z4 barbed, stout; the remaining setae shorter, smooth. Setae r3 and R1 on interscutal membrane, smooth. Peritreme extending to between setae j1. Sternal shield with 3 pairs of setae; metastenal platelets much longer than width. Ventrianal shield wider than genital shield; with 3 pairs of preanal setae, a pair of pores. Seta JV5 smooth. 2 pairs of slender metapodal platelets. Spermatheca as figured. Fixed digit with multidentate, and pilus dentilis; movable digit with 3 teeth. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1, 2/0-1. Leg Ⅳ with 3 tapering macrosetae. Lengths of setae (n=10, mean): j1 21.6, j3 17.5, j4 7.0, j5 7.0, j6 9.7, J2 11.1, J5 7.0, z2 11.4, z4 13.9, z5 7.9, Z1 10.7, Z4 54.9, Z5 82.1, s4 19.0, S2 15.4, S4 12.9, S5 11.2, r3 12.6, R1 9.0, JV5 33.9, macrosetae on leg Ⅳ: genu 35.4, tibia 29.0, basitarsus 57.2.

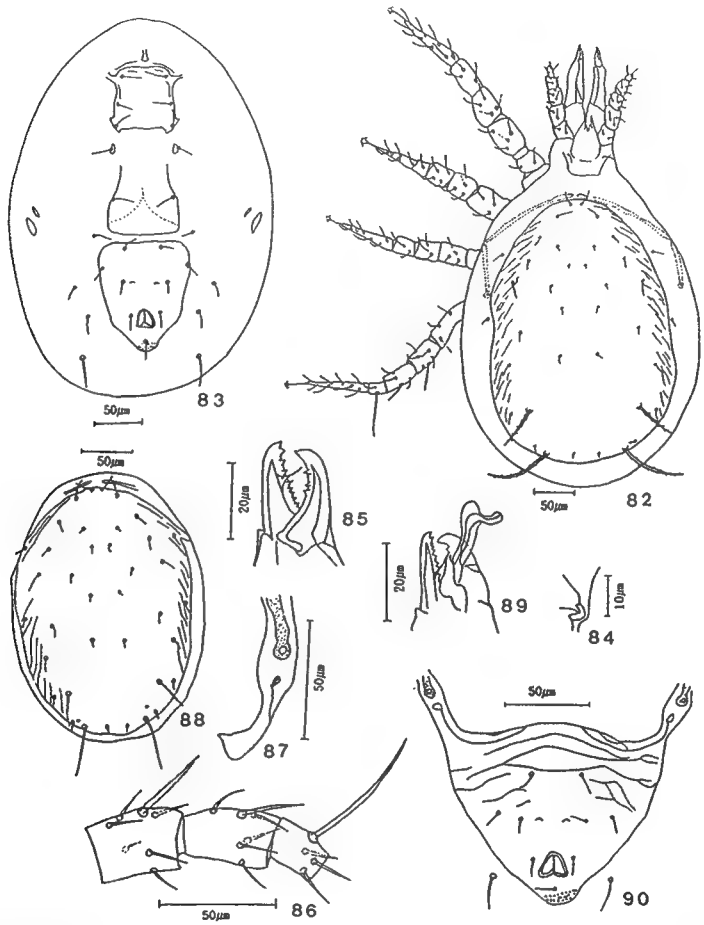
Male. Setae r3 and R1 on dorsal shield. Peritreme extending to seta j1. Ventrianal shield fused with peritrematal shield; 3 pairs of preanal setae, a pair of pores. Chelicera with 9 teeth and pillus dentilis on fixed digit; movable digit with 3 teeth. Spermatodactyl as figured. Lenghts of setae(n=10, mean): j1 18.2, j3 21.3, j4 7.4, j5 7.1, j6 7.9, J2 9.4, J5 6.5, z2 10.1, z4 12.1, z5 7.4, Z1 9.1, Z4 39.4, Z5 57.2, s4 17.8, S2 14.3, S4 11.5, S5 10.2, r3 12.4, R1 9.6, JV5 24.2, macrosetae on leg Ⅳ: genu 25.6, tibia 22.8, basitarsus 48.4.

Specimens examined. 13♀, Kwanchon, Imshil, JB, 23-Ⅶ-1988, on *Prunus serruata* Lindley var. *spontanea*(Max.) Makino; 44♀, Mujuguchondong, Muju, JB, 7-Ⅶ-1988, on *Weigela subsessilis* L.H. Bailey; 15♀ & 5♂, Mt. Sonun-san, Kochang, JB,19-Ⅷ-1988, on *Castanea crenata* S. et Z.; 15♀ & 11♂, Unam, Imshil, JB, 24-Ⅷ-1988, on *Rhus verniciflua* Stokes; 1♀ & 2♂, Soyang, Wanju, JB, 17-Ⅵ-1990, on *Corylus heterophylla* var. *thunbergii*; 1♀, Mujuguchondong, Muju, JB, 4-Ⅶ-1990, on *Acer pseudo-sieboldianum* (Paxton) Kom.; 11♀ & 1♂, Mt. Sonun-san, Kochang, JB, 25-Ⅶ-1990, on *Boehmeria spicata* Thunb.; 6♀ & 1♂, Mt. Naejang-san, Chongup, JB, 1-Ⅷ-1990, on *Fraxinus rhynchophylla* Hance; 1♀, Chongyong, GG, 12-Ⅷ-1989, on *Corylus heterophylla* var. *thunbergii* Bl.; 8♀ & 3♂, Yonchon, GG, 16-Ⅸ-1989, on *Corylus heterophylla* Fisch.; 1♀, Chungju, CB, 7-Ⅷ-1989, on *Ailanthus altissima* Swingle; 12♀ & 3♂, Whayanggugok, CB, 20-Ⅶ-1990, on *Stphanandra incisa*

Zabel; 4♀ & 2♂, Suanbo, CB, 20-Ⅶ-1990, on *Ulmus davidiana* Planch. var. *japonica* Nakai; 2♀ & 1♂, Tanyang, CB, 21-Ⅶ-1990, on *Vitis amurensis* Rupr.; 5♀, Tanyang, CB, 21-Ⅶ-1990, on *Actinidia agruta* Planch.

Distributions. Korea, Japan.

Remarks. Previously *A. oguroi was* known from Japan.



Figs. 82-90. *Amblyseius oguroi* Ehara. 82, dorsum(♀); 83, venter of idiosoma(♀); 84, spermatheca; 85, chelicera(♀); 86, genu, tibia, and basitarsus of leg Ⅳ(♀); 87, peritrematal shield(♀); 88 dorsum of idiosoma(♂); 89, chelicera(♂); 90, ventrianal shield(♂).

***Amblyseius* (*Amblyseius*) *volgini* Wainstein et Begljarov 갈색이리응애 (Figs. 91-100)**

Amblyseius volgini Wainstein et Beglgarov. 1971, p. 1804, fig. 2., Ryu and Ehara, 1991, p. 23-40, figs. 9-18.

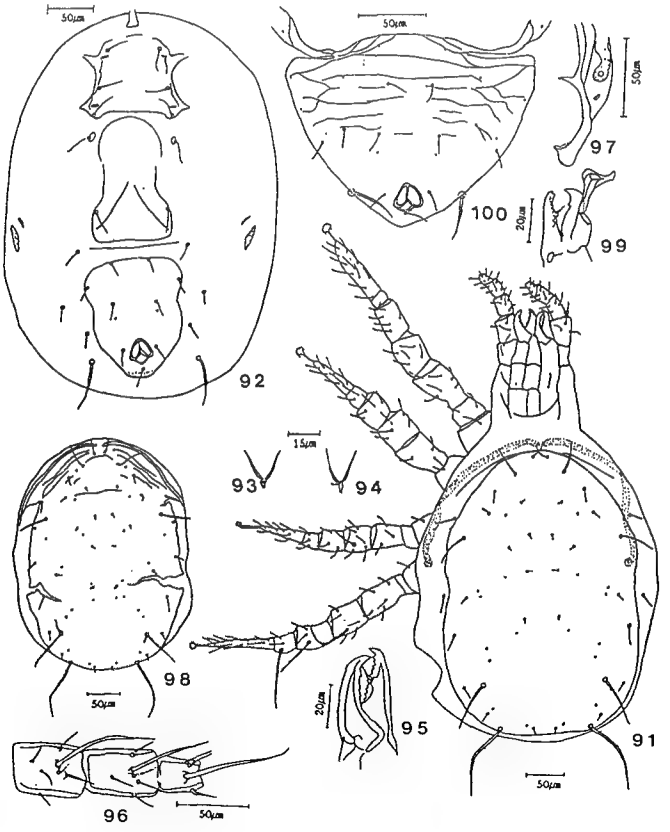
Amblyseius magnus Wu, 1987, p. 261. figs. 5-11, syn. nov.

Female. Body brown in colour. Dorsal shield 389 long, 238 wide at level of waist; smooth, with at least 7 pairs of small pores. Setae on dorsal shield: Z5 the longest, barbed; Z4 slightly barbed; the remaining setae smooth; s4 longer than j3; S2 longer than Z1; z2 longer than z4. Setae r3 and R1 on

interscutal membrane, smooth. Peritreme extending to between setae j1. Sternal shield with 3 pairs of setae; metasternal platelets much longer than wide. Ventrianal shield wider than genital shield; with 3 pairs of preanal setae, a pair of pores. Seta JV5 smooth. 2 pairs of slender metapodal paltelets. Spermacheca as figured. Fixed digit with multidentate, and pilus dentilis; movable digit with 3 teeth. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1. 2/0-1. Leg Ⅳ with 3 tapering macrosetae. Lengths of setae(n=10, mean): j1 23.8, j3 40.1, j4 7.5, j5 6.6, j6 7.3, J2 7.1, J5 9.8, z2 19.0, z4 13.8, z5 5.9, Z1 9.9, Z4 65.7, Z5 101.2, s4 46.0, S2 21.8, S4 11.9, S5 10.5, r3 18.6, R1 18.7, JV5 52.4, macrosetae on leg Ⅳ: genu 65.9, tibia 52.1, basitarsus 72.8.

Male. Setae r3 and R1 on dorsal shield. Periterme extending to between setae j1. Ventrianal shield reticulate, fused with peritrematal shield; 4 pairs of preanal setae; 5 pairs of preanal pores. Chelicera with 7 teeth and pilus dentilis on fixed dight; movable digit unidentate. Spermatodactyl as figured. Lengths of setae (n=6, mean); j1 21.8, j3 39.8, j4 6.8, j5 6.7, j6 7.5, J2 7.0, J5 8.7, z2 13.8, z4 12.8(n =5), z5 5.8, Z1 9.3, Z4 61.7, Z5 88.5, s4 43.8, S2 20.2, S4 12.0, S5 11.0, r3 17.7, R1 16.5, JV5 40.3, macrosetae on leg Ⅳ: genu 53.2, tibia 38.5, basitarsus 60.3.

Specimens examined. 1♀, Chonbuk Univ. Campus, Chonju, JB. 6-Ⅷ-1987, on *Chamaecyparis obtusa*



Figs. 91-100. *Amblyseius volgini* Wainstein et Begljarov. 91, dorsum(♀); 92, venter of idiosoma(♀); 93-94, spermatheca; 95, chlicera(♀); 96, genu, tibia, and basitarsus of leg Ⅳ(♀); 97. peritrematal shield(♀); 98, dorsum of idiosoma(♂); 99. chelicera(♂); 100, ventrianal shield(♂).

S. et Z.; 1♀, Chonbuk Univ. Campus, Chonju, JB, 6-Ⅷ-1987, on *Juniperus chinensis* L.; 1♀ & 1♂, Chonbuk Univ, Campus, Chonju, JB, 5-Ⅷ-1987, on *Cedrus deodara*(Roxb.) Loud.; 5♀ & 2♂, Mujuguchondong, Muju, JB 7-Ⅷ-1988, on *Abies koreana* Wilson; 1♂, Mujuguchondong, Muju, JB, 8-Ⅷ-1988, on *Abies holophylla;* 2♀, Mt. Sonun-san, Kochang, JB, 19-Ⅷ-1988, on *Pinus densiflora* S. et Z.; 2♀ & 2♂, Mt. Naejang-san, Chongup, JB, 1-Ⅷ-1990, on *Abies holophylla;* 1♀, Kogju, CN, 14-Ⅷ-1987, on *Abies holophylla* Maxim.

Distributions. Korea, China, the former U.S.S.R.

Remarks. *A. volgini* was previously recorded from the former U.S.S.R. and recorded as *A. magnus* by Wu (1987) from China.

***Typhlodromus* (*Paraseiulus*) *yokogawae* Ehara et Hamaoka 바늘이리응애 (Figs. 101-110)**

Typhlodromus(*Paraseiulus*) *yokogawae* Ehara et Hamaoka, 1980, p. 3-5, figs, 1-7, Ryu and Lee, 1992. p. 35-36, figs. 59-68.

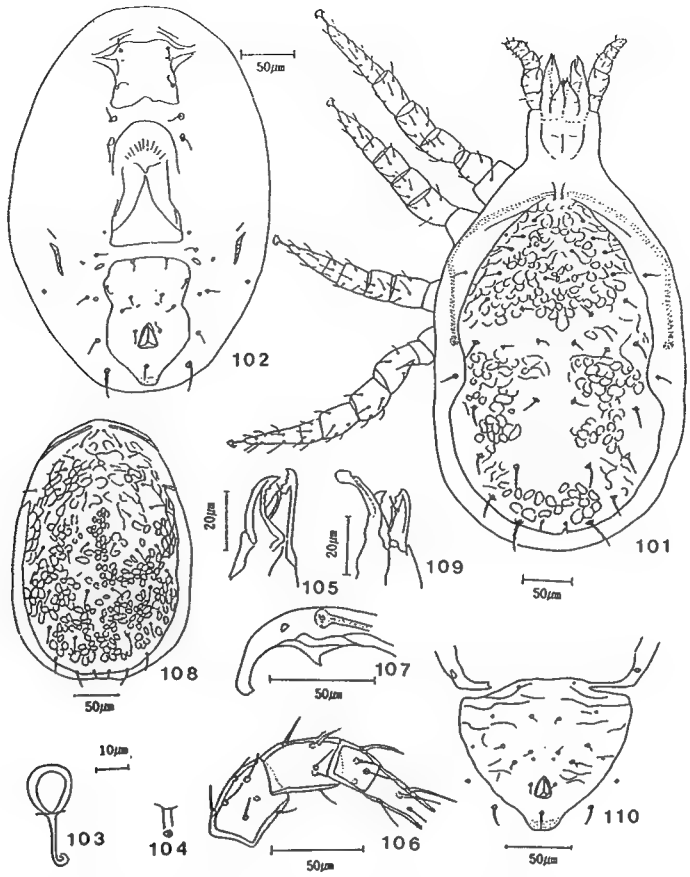
Female. Dorsal shield 357 long, 191 wide at level of waist; rugose, reticulate, and with 19 pairs of setae. Setae on dorsal shield set on tubercles; Z5 the longest, barbed; the remaining setae shorter, smooth. Setae r3 and R1 on interscutal membrane, smooth. Peritreme extending to seta j1. Sternal shield with posterior margin strongly concave, with 2 pairs of setae, ST1 and St2, third pair, ST3, on seperate platelets; metasternal platelets longer than width. Ventrianal shield wider than genital shield; 4 pairs of preanal setae; a pair of pores. Seta JV5 smooth. 2 pairs of slender metapodal platelets, the poterior pair much larger. Spermatheca with cervix slender, wide distally. Fixed digit with 4 teeth, and pilus dentilis; movable digit with 3 teeth. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/0, 2/0-1, Leg Ⅳ with 2 macrosetae. Lengths of setae(n=10, mean): j1 16.7, j3 14.6, j4 11.4, j5 11.2, j6 12.4, J2 17.5, J5 11.1, z2 12.7, z3 15.5, z4 14.8, z5 11.9, z6 14.6, Z4 20.2, Z5 27.4, s4 16.5, s6 18.3, S2 19.0, S4 20.6 S5 21.5, r3 16.1, R1 16.9, JV5 24.2, macrosetae on leg Ⅳ: basitarsus 21.4, telotarsus 25.6.

Male. Setae r3 and R1 on dorsal shield. Peritreme not extending anterior to seta j1. Ventrianal shield only fused with one side of peritrematal shield or not fused with peritrematal shield; 4 pairs of preanal setae, 4 pairs of pores. Chelicera with 3 teeth and pilus dentilis on fixed digit; movable digit unidentate. Spermatodactyl as figured. Lengths of setae(n=4, mean): j1 13.8, j3 14.8, j4 10.5, j5 10.3, j6 12.0, J2 14.8, J5 10.5, z2 12.3, z3 14.0, z4 14.8, z5 15.0, z6 12.3, Z4 18.3, Z5 21.5, s4 15.5, s6 16.3, S2 17.0, S4 17.5, S5 17.5, r3 14.3, R1 14.3, JV5 17.3, macrosetae on leg Ⅳ: basitarsus 17.5, telotarsus 19.8.

Specimens examined. 2♀, Chonju, JB, 3-Ⅷ-1987, on *Abies holophylla* Max.; 15♀ & 2♂, Chonju, JB, 5-Ⅷ-1988, on *Abies holophylla;* 13♀ & 2♂, Chonju, JB, 7-Ⅸ-1989, on *Abies holophylla*; 19♀ & 2♂, Mt. Naejang-san, Chongup, JB, 1-Ⅷ-1990, on *Torreya nucifera* S. et Z.

Distributions. Korea, Japan.

Remarks. Previously *T. yokogawae* was known from Japan. This species was collected on *Abies holopylla* together with spider mite, *Oligonychus ununguis* (Jacobi).



Figs. 101-110. *Typhlodromus yokogawae* Ehara et hamaoka. 101, dorsum(♀); 102, venter of idiosoma(♀); 103-104, spermatheca; 105, chelicera(♀); 106, genu, tibia, and tarsus of leg Ⅳ(♀); 107, peritrematal shield(♀); 108, dorsum of idiosoma(♂); 109, chelicera(♂); 110, ventrianal shield(♂).

***Typhlodromus* (*Paraseiulus*) *deogyuensis* Ryu et Ehara 느릅이리응애 (Figs. 111-120)**

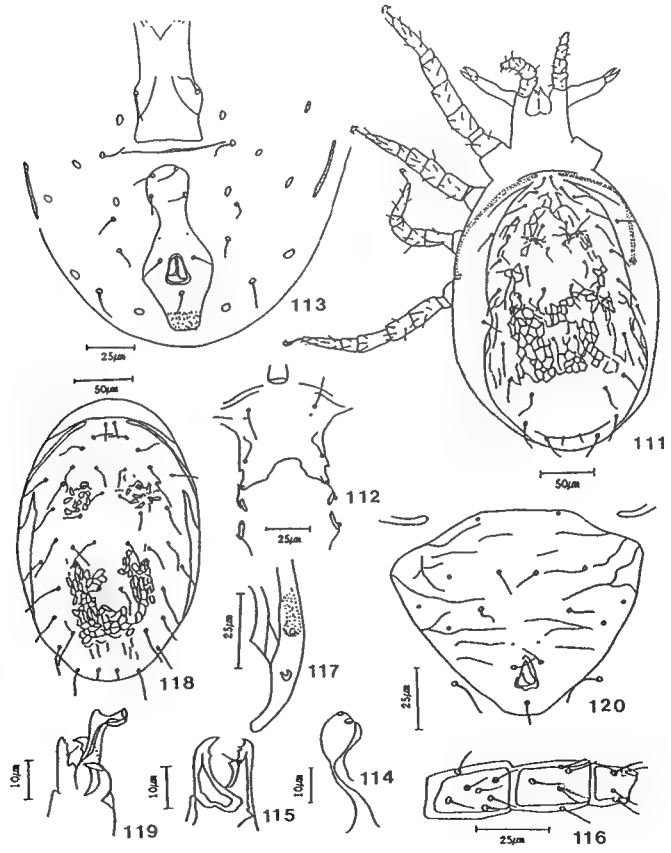
Typhlodromus (*Paraseiulus*) *deogyuensis* Ryu et Ehara, 1990, p. 145-150, fig. 1-9.

Female. Dorsal shield 283 long, 142 wide at level of waist. Dorsal shield reticulate, 2 pairs of very large, distinct pores on dorsal shield, one between setae z4 and z5 and the other posterior to z6. Setae on dorsal shield: S2 the longest; Z5 slightly barbed, the remaining setae smooth: Z4 about as long as distance between bases of Z4 and S5. Setae r3 and R1 on intesuctal membrane, smooth, Peritreme extending anteriorly to level of j3; Sternal shield with posterior margins strongly concave, with 2 pairs of setae, third pairs of sternal setae on platelets; metasternal platelets much longer than width. Ventrianal shield slender, slightly narrower than genital shield, with a distinct waist, widest at level of anus; 2 pairs of preanal setae anterior to the waist; a pair of very small, indistinct preanal pores. Seta JV5 smooth. 2 pairs of slender metapodal platelets. Spermatheca as figured. Fixed digit of chelicera with 2 subapical teeth, 1 middle tooth, and with pilus dentilis; movable digit unidentate. Chaetotaxic formula: genu Ⅱ, 2-2/1, 2/0-1; genu Ⅲ, 1-2/1, 2/0-1. Leg Ⅳ without macrosetae.

Lengths of setae(n=10, mean): j1 10.6, j3 23.0, j4 15.8, j5 15.6, j6 26.6, J2 28.9, J5 8.2, z2 22.7, z3 23.7, z4 24.9, z5 17.3, z6 24.7, Z4 27.1, Z5 22.4, s4 25.7, s6 28.6, S2 30.1, S4 21.8, S5 19.6, r3 22.7, R1 19.0, JV5 14.3.

Male. Setae r3 and R1 on dorsal shield. Peritreme extending anteriorly to level of j3. Ventrianal shield not fused with peritrematal shield, with 2 pairs of preanal setae; five of small pores. Fixed digit of chelicera with 2 subapical teeth; movable digit unidentate. Spermatodactyl as figured. Lengths of setae (n=7, mean): j1 11.3, j3 25.5, j4 17.0, j5 16.9, j6 30.4, J2 32.3, J5 8.6, z2 22.9, z3 25.1, z4 27.6, z5 17.7, z6 27.6, Z4 33.0, Z5 25.1, s4 29.4, s6 33.4, S2 36.4, S4 26.6, S5 25.3, r3 23.4, R1 21.3, JV5 13.4.

Specimens examined. 10♀ & 3♂, Mujuguchondong, Muju, JB, 7-Ⅷ-1988, on *Ulmus davidiana* Planch. var. *japonica* (Rehd) Nakai; 1♀, Mujuguchondong, Muju, JB, 16-Ⅷ-1989, on *Ulmus davidiana* var. *japonica;* 6♀ & 4♂, Mujuguchondong, Muju, JB, 4-Ⅶ-1990, on *Ulmus davidiana* var. *japonica.*



Figs. 111-120. *Typhlodromus doegyuensis* Ryu et Ehara. 111. dorsum(♀); 112, sternal shield(♀); 113, posterior ventral surface(♀); 114, spermatheca; 115, chelicera(♀); 116, genu, tibia, and basitarsus of leg Ⅳ (♀); 117, peritrematal shield(♀); 118, dorsum of idiosoma(♂); 119, chelicera(♂); 120, ventrianal shield(♂).

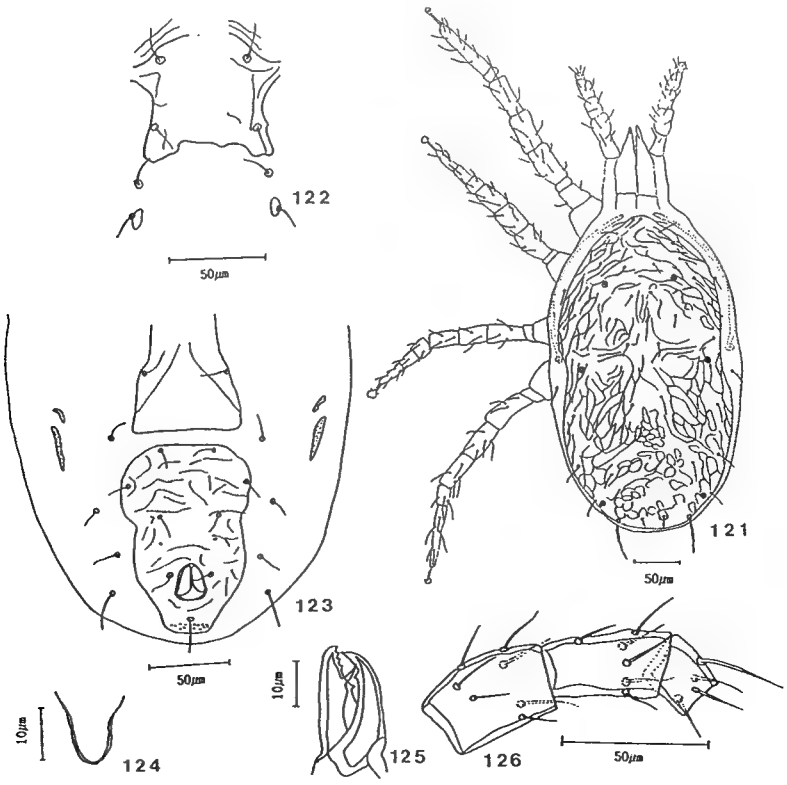
Distribution. Korea

Remark. *T. deogyunsis* has two pairs of very large, distinct pores on dorsal shield, seta ST3 on separate platelets, and two pairs of preanal setae on ventrianal shield and is an endemic species.

***Typhlodromus* (*Anthoseius*) *wonkooi* Ryu et Ehara 짧은털이리응애 (Figs. 121-126)**

Typhlodromus wonkooi Ryu et Ehara, 1992, p. 723-725, figs. 1-6.

Female. Dorsal shield 366 long, 173 wide at level of waist; reticulate, with 3 pairs of distrinct pores: the first between setae j4 and z4, the second poterior to s6, and the third near S5. Setae on dorsal shield: Z5 the longest, barbed; the remaining setae much shorter, smooth. Setae r3 and R1 on interscutal membrance, smooth. Peritreme extending beyond the level of seta j3. Sternal shield with 2 pairs of setae, ST1 and ST2; third pair, ST3, free on intersuctal membrane; metasternal platalets much longer than wide. Ventrianal shield wider than genital shield; 3 pairs of preanal setae, a pair of pores, Seta JV5 smooth. 2 pairs of slender metapodal platelets. Spermatheca with bell-shaped cervix. Fixed digit with 4 teeth and pilus dentilis; movable digit unidentate. Chaetotaxic formula: genu Ⅱ, 2 -2/0, 2/0-1; genu, Ⅲ 1-2/1. 2/0-1, Lengths of setae(n=9, mean): j1 17.8, j3 18.9, j4 13.4, j5 14.7, j6 16.4, J2 18.7, J5 10.6, z2 13.9, z3 18.7, z4 17.6, z5 14.8, Z4 23.4, Z5 41.1, s4 19.2, s6 21.3, S2 21.8, S4 24.2, S5(n=8) 19.4, r3 20.1, R1 20.0, JV5 24.3, macroseta on basitarsus Ⅳ 28.0.



Figs. 121-126. *Typhlodromus wonkooi* Ryu et Ehara. 121. dorsum(♀); 122, sternal shield(♀); 123, posterior ventral surface(♀); 124, spermatheca; 125, chelicera(♀); 126, genu, tibia, and basitarsus of leg Ⅳ(♀)

Male. Not known.

Specimens examined. 3♀, Mujuguchondong, Muju, JB, 7-Ⅷ-1988, on *Abies koreana* Wilson; 6♀, Mujuguchondong, Muju, JB, 6-Ⅹ-1991, on *Abies koreana.*

Distribution. Korea.

Remark. *T. wonkooi* was collected on *Abies koreana* together with spider mite, *Oligonychus ununguis* (Jacobi) and is an endemic species.

***Typhlodromus* (*Anthoseius*) *yasumatsui* Ehara 잎금이리응애 (Figs. 127-135)**

Typhlodromus (*Anthoseius*) *yasumatsui* Ehara, 1966, p. 11-12, figs. 7-14; Ehara, 1975, p. 26, 31, fig. 12; Ehara, 1977, p. 31, Ehara, 1980, p. 53, fig. 14-D; Ryu and Lee, 1992, p. 32-35, figs. 50-58.

Female. Dorsal shield 293 long, 165 wide at level of waist; strong sclerotized, reticulate, with two distrinct pores, one between setae z3 and j4 and the other between setae s4 and s6. Setae on dorsal shield: Z5 the longest, stout, strongly serrate, capitate; the remaining setae shorter, smooth. Setae r3 and R1 on interscutal membrance, smooth. Peritreme extending to level of j1. Sternal shield with projections posteriorly, with two pairs of setae, ST1 and ST2, third pair, ST3, free on interscutal membrane; metasternal platelets much longer than width. Ventrinal shield wider than genital shield; with four pairs of preanal setae, a pair of pores. Seta JV5 stout, capitate, smooth. Two pairs of slender metapodal platelets. Spermatheca with cervix U-shaped. Fixed digit with 3 teeth, and pilus dentilis; movable digit with 3 teeth. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1, 2/0-1, Leg Ⅳ with four submacrosetae. Lengths of setae (n=7, mean): j1 11.9, j3 11.7, j4 9.9, j5 9.9, j6 10.6, J2 11.4, J5 8.6, z2 10.7, z3 12.0, z4 12.7, z5 9.9, Z4 17.0, Z5 37.9, s4 14.6, s6 14.6, S2 14.7, S4 11.6, S5 10.4, r3 13.6, R1 11.6, JV5 15.1, macrosetae on leg Ⅳ: genu 11.1, tibia 11.6, basitarsus 17.0, telotarsus 18.3.

Male. Setae r3 and R1 on dorsal shield. Peritreme extending to seta j1. Ventrianal shield fused with peritrematal shield; four pairs of preanal setae, four pairs of small pores. Chelicera with 3 teeth and pilus dentilis on fixed digit; movable digit unidentate. Spermatodactyl as figured. Leg Ⅳ with four submacrosetae. Lengths of setae (n=5, mean): j1 11.2, j3 11.0, j4 9.2, j5 9.0, j6 9.0, J2 9.8, J5 8.0, z2 9.8, z3 10.0, z4 10.8, z5 9.2, Z4 14.2, Z5 25.2, s4 12.2, s6 11.2, S2 12.2, S4 10.4, S5 9.2, r3 11.4, R1 9.0, JV5 10.2, macrosetae on leg Ⅳ: genu 9.4, tibia 10.2, basitarsus 14.8, telotarsus 14.6.

Specimens examined. 5♀, Mt. Naejang-san, Chongup, JB 1-Ⅷ-1990, on *Diopyros kaki* Thunb.: 11 ♀ & 5♂, Mt Naejang-san, Chongup, JB, 12-Ⅷ-1990, on *Diopyros kaki.*

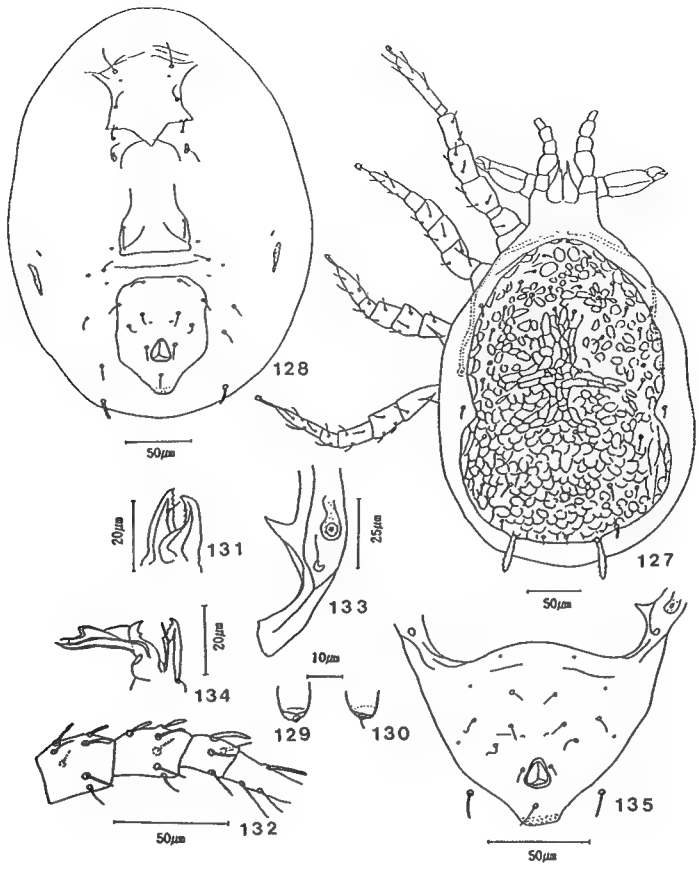
Distributions. Korea, Japan.

Remarks. Previously *T. yasumatsui* was known from Japan. This species is characterisitic in dorsal shield heavily sclerotized and seta Z5 stout, strongly serrate, and capitate.

***Typhlodromus* (*Anthoseius*) *serrulatus* Ehara 톱니이리응애 (Figs. 136-145)**

Typhlodromus (*Anthoseius*) *serrulatus* Ehara, 1972, p. 142-143, figs. 19-24; Ehara, 1975, p. 25, 32, fig, 14; Ehara, 1977, p. 31, Ehara, 1980, p, 53, fig. 14-C; Ryu and Lee, 1992, p. 31-33, figs. 40-49.

Female. Dorsal shield 323 long, 165 wide at level of waist; imbricate, reticulate, with at least 4



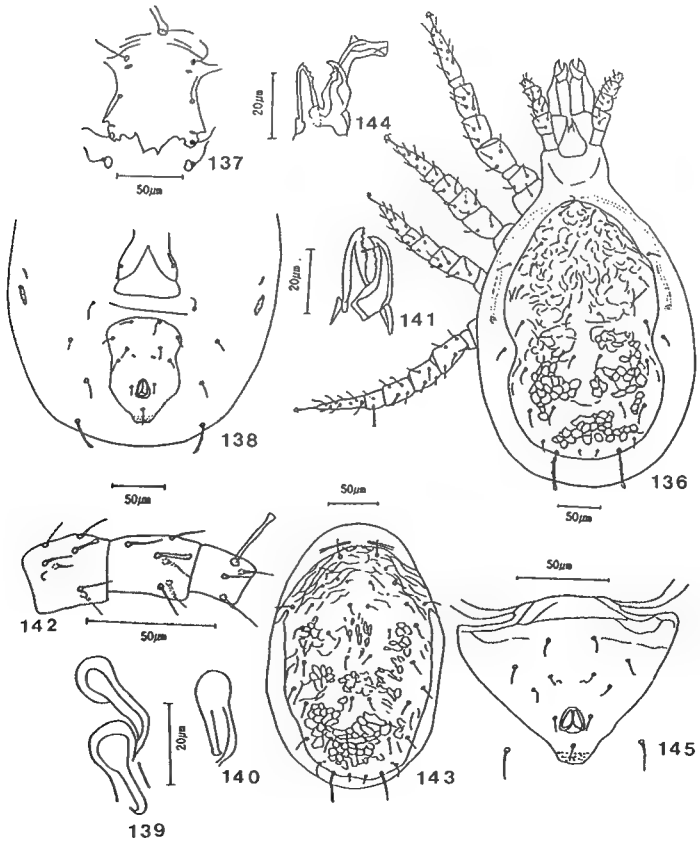
Figs. 123-135. *Typhlodromus yasumatsui* Ehara. 127, dorsum(♀); 128, venter of idiosoma(♀); 129-130. spermatheca; 131, chelicera(♀); 132, genu, tibia, and tarsus of leg Ⅳ(♀); 133, peritrematal shield (♀); 134, chelicera(♂); 135, ventrianal shield(♂)

pairs of pores. Setae on dorsal shield: Z5 the longest, barbed, stout. capitate; Z4 slightly barbed; the remaining setae shorter, smooth. Setae r3 and R1 on interscutal membrane, smooth. Peritreme extending to between setae j1. Sternal shield with indentations posteriorly, with 3 pairs of setae; metasternal platelets oval. Ventrianal shield wider than genital shield; 4 pairs of prenanal setae, a pair of pores. Seta JV5 stout, capitate. 2 pairs of slender metapodal platelets. Spermatheca as figured, Fixed digit with 6 teeth and pilus dentilis; mobable digit with 3 teeth, Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1, 2/0-1. Leg Ⅳ with 3 capitate macrosetae, Lengths of setae(n =10, mean): j1 16.4, j3 17.7, j4 12.6, j5 15.1, j6 16.7, J2 19.0, J5 8.8, z2 14.6, z3 16.6, z4 17.2, z5 14. 9, Z4 24.1, Z5 43.1, s4 18.9, s6 21.5, S2 22.4, S4 23.8, S5 16.2, r3 19.9, R1 16.9, JV5 29.9, macrosetae on leg Ⅳ: genu 12.0, tibia 14.8, basitarsus 26.6.

Male. Setae r3 and R1 on dorsal shield. Peritreme extending to seta j3. Ventrianal shield fused with peritrematal shield; 4 pairs of preanal setae, a pair of pores. Chelicera with 3 teeth and pilus dentilis on fixed digit; mobable digit unidentate. Spermatodactyl as figured. Lengths of setae (n=5, mean);

j1 15.6, j3 17.4, j4 10.8, j5 12.2, j6 12.8, J2 14.8, J5 8.2, z2 12.0, z3 14.8, z4 15.0, z5 12.0, Z4 18.2, Z5 29.0, s4 17.2, s6 18.2, S2 18.4, S4 15.8, S5 12.2, r3 17.2, R1 14.2, JV5 16.8, macrosetae on leg Ⅳ: genu 8.8, tibia 10.6, basitarsus 19.2.

Specimens examined. 11♀, Mujuguchondong, Muju, JB, 8-Ⅷ-1988, on *Castanea crenata* S. et Z.; 1♀, Mt. Chiri-san, Namwon, JB, 22-Ⅶ-1989, on *Cornus officinalis* S. et Z.: 3♀, Mt. Naejang-san, Chongup, JB, 1-Ⅷ-1990, on *Rhododendron schlippenbachii* Max. 2♀, Chungju, CB, 7-Ⅷ-1989, on *Celtis koraiensis* Nakai: 1♀, Chungju, CB, 7-Ⅷ-1990, on *Lindera obtusiloba* Bl.; 5♀♀, Tanyang, CB, 21-Ⅶ-1990, on *Quercus acutissima* Carruth; 4♀ & 1♂, Tanyang, CB, 21-Ⅶ-1990, on *Actinidia agruta* Planch.; 11♀ & 4♂, Mt. Chiak-san, Wonju, GW, 11-Ⅷ-1989, on *Sorbus alnifolia* (S. et Z.) K. Koch.; 5♀, Chunchon, GW, 12-Ⅷ-1989, on *Koelreuteria paniculata* Laxm.; 2♀, Masan, KN, 20-Ⅹ-1989, on *Quercus mongolica* Fisch.; 1♀, Mt. Palgong-san, GB, 2-Ⅹ-1989, on *Pueraria thunbergiana* Benth.; 4♀, Mt. Palgong-san, GB, 2-Ⅹ-1989, on *Alnus hirsuta* var. *sibirica* (Spach) Schneid.; 2♀ & 1♂, Mt. Kaya-san, GN, 19-Ⅶ-1991, on *Styrax obassia* S. et Z.; 3♀, Haenam, JN, 20-Ⅶ-1991, on *Sorbus alnifolia*.



Figs. 136-145. *Typhlodromus serrulatus* Ehara, 136, dorsum(♀); 137, sternal shield(♀); 138, posterior ventral surface(♀); 139-140, spermatheca; 141, chelicera(♀); 142, genu, tibia, and basitarsus of leg Ⅳ (♀); 143, dorsum of idiosoma(♂); 144, chelicera(♂); 145, ventrianal shield(♂)

Distributions. Korea, Japan.

Remarks. Previously *T. serrulatus* was from Japan. This species is characterized by seta Z5 stout, barbed, and capitate and leg Ⅳ with three pairs of capitate macrosetae.

***Typhlodromus* (*Antoseius*) *vulgaris* Ehara 대중이리응애 (Figs. 146-154)**

Typhlodromus vulgaris Ehara, 1959, p. 286-288, figs. 1-5; Ehara, 1961, p. 95-96, figs. 1-2; Lee, 1961, p. 64; Ehara, 1962, p. 53; Ehara, 1964, p. 381.

Typhlodromus (*Anthoseius*) *vulgaris* Ehara, 1977. p. 31; Ehara, 1980, p. 55, fig. 15-A; Ryu and Ehara, 1990, p. 147.

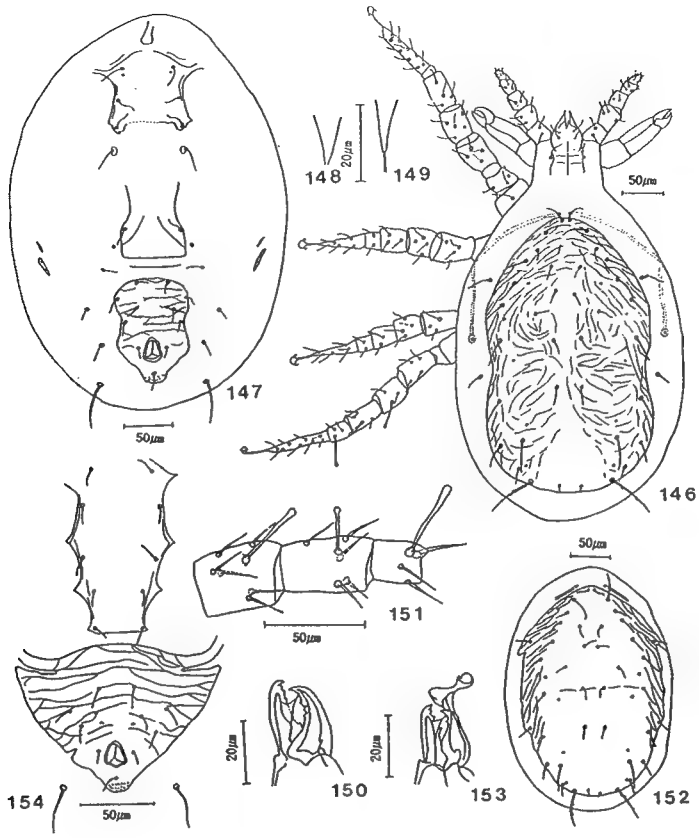
Female. Dorsal shield 355 long, 190 wide at level of waist; slightly reticulate, with at least 5 pairs of small pores. Setae on dorsal shield: Z5 the longest, barbed; the remaining setae shorter, smooth; Z4 longer than distance between bases of Z4 and S5. Setae r3 and R1 on interscutal membrane, smooth. Peritreme extending to seta j1. Sternal shield with 3 pairs of setae; metasternal platelets much longer than width. Ventrianal shield wider than genital shield; 4 pairs of preanal setae, a pair of pores, Seta JV5 smooth. 2 pairs of slender metapodal platelets. Spematheca with cervix V-shaped. Fixed digit with 4 teeth, and pilus dentilis; movable digit with 3 teeth. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1, 2/0-1. Leg Ⅳ with 3 capitate macrosetae; genu Ⅲ with a capitate macroseta, Lengths of setae (n=10, mean); j1 23.7, j3 32.6, j4 16.5, j5 17.0, j6 19.4, J2 20.4, J5 8.4, z2 17.1, z3 25.7, z4 25.6, z5 16.4, Z4 35.8, Z5 57.8, s4 30.3, s6 30.9, S2 28.6, S4 23.0, S5 20.5, r3 23.1, R1 17.1 JV5 43.9, macrosetae on leg Ⅳ: genu 30.7, tibia 19.5, basitarsus 34.7.

Male. Setae r3 and R1 on dorsal shield. Peritreme not extending to seta j1. Ventrinal shield fused with peritrematal shield; 4 pairs of preanal setae, a pair of pores. Chelicera with 3 teeth and pilus dentilis on fixed digit; movable digit unidentate. Spermatodactyl as figured. Lenghts of setae(n=5, mean): j1 21.0, j3 32.8, j4 17.0, j5 17.3, j6 17.0, J2 17.2, J5 9.0, z2 17.9, z3 23.2, z4 22.7, z5 17.0, Z4 31.5, Z5 42.0, s4 25.9, s6 25.8, S2 22.9, S4 21.4, S5 16.8, r3 22.1, R1 14.5, JV5 29.4, macrosetae on leg Ⅳ: genu 18.2, tibia 17.9, basitarsus 27.0.

Specimens examined. 1♀, Soyang Wanju, JB, 7-Ⅷ-1988, on *Abies holophylla* Max.; 1♀, Taeya, Okgu, JB, 15-Ⅶ-1989, on *Prunus serrulata* Lindley var. *spontanea* (Maxim.) Makino; 2♀, Kyokpo, Pusan, JB, 27-Ⅷ-1989, on *Platycarya strobilacea* S. et Z.; 9♀♀, Taeya, Okgu, JB, 4-Ⅹ-1991, on *Pinus densiflora* S. et Z.; 32♀ & 14♂, Mt. Wolchul-san, Yongam, JN, 29-Ⅵ-1989, on *Alangium platanifolium* var. *macrophylum* (S. et Z.) Wanger; 3♀ & 1♂, Mt. Wolchul-san, Yongam, JN, 29-Ⅵ-1989, on *Pyrus ussuriensis* Refder; 2♀, Sunchon JN, 20-Ⅷ-1989, on *Castanea crenata* S. et Z.; 11♀ & 3♂. Chinju, GN, 2-Ⅹ-1989, on *Ailanthus altissima* Swingle; 3♀ & 3♂, Kunnam, Yonchon, GG, 21-Ⅷ-1992, on *Corylus heterophylla* Fisch.

Distributions: Korea, Japan.

Remarks. *T. vulgaris* has a macroseta on genu Ⅲ and seta Z4 longer than distance between bases of Z4 and S5.



Figs. 146-154. *Typhlodromus vulgaris* Ehara. 146, dorsum(♀); 147, venter of idiosoma(♀); 148-149, spermatheca; 150, chelicera(♀); 151, genu, tibia, and basitarsus of leg Ⅳ (♀); 152, dorsum of idiosoma(♂); 153, chelicera(♂); 154, venter of idiosoma(♂).

***Typhlodromus* (*Anthoseius*) *chinensis* Ehara et Lee 청이리응애 (Figs. 155-163)**

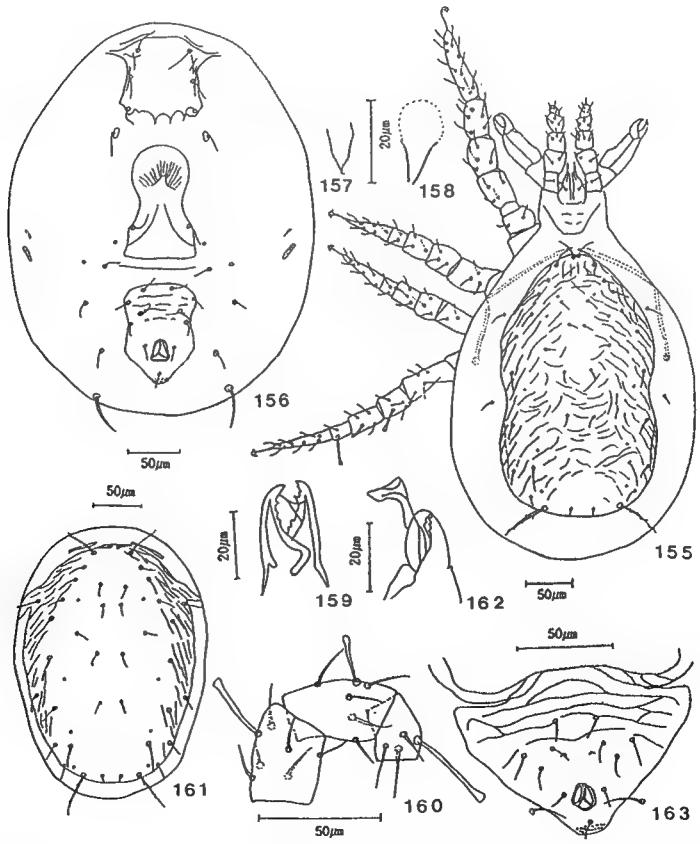
Typhlodroms (*Anthoseius*) *chinensis* Ehara et Lee, 1971, p. 62-64, figs, 1-7, Ryu and Lee, 1992, p. 30-31, figs. 31-39.

Female. Dorsal shield 344 long, 180 wide at level of waist; slightly reticulate, with at least 5 pairs of small pores. Setae on dorsal shield: Z5 the longest, barbed; the remaining setae shorter, smooth; Z4 shorter than distance between bases of Z4 and S5. Setae r3 and R1 on intersuctal membrane, smooth. Peritreme extending to seta j1. Sternal shield with indentations posteriorly, with 3 pairs of setae; metasternal platelets much longer than width. Ventrianal shield wider than genital sheld; 4 pairs of preanal setae, a pair of pores. Seta JV5 smooth. 2 pairs of slender metapodal platelets. Spematheca with cervix V-shaped. Fixed digit with 5 teeth and pilus dentilis; movable digit with 3 teeth. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1. 2/0-1. Leg Ⅳ with 3 capitate macrosetae; genu Ⅲ with a capitate macroseta. Lengths of setae (n=10, mean): j1 23.7, j3 29.6, j4 14.8, j5 14.7, j6 15.9, J2 16.2 J5 7.7, z2 15.7, z3 23.8, z4 20.0, z5 14.8, Z4 30.4, Z5 57.4, s4 24.6, s6 25.4, S2 20.9, S4 20.2, S5 16.4, r3 20.3, R1 13.7, JV5 39.8, macrosetae on leg Ⅳ: genu 32.1, tibia 20.

3, basitarsus 39.1.

Male. Setae r3 and R1 on dorsal shield. Peritreme extending to seta j3. Ventrianal shield fused with peritrematal shield; 4 pairs of preanal setae, a pair of pores. Chelicera with 3 teeth and pilus dentilis on fixed digit; movable digit unidentate. Spermatodactyl as figured, Lengths of setae (n=5, mean): j1 21.2, j3 33.4, j4 15.6, j5 15.2, j6 14.8, J2 15.0, J5 7.6, z2 16.6, z3 22.8, z4 20.4, z5 15.4, Z4, 29.2, Z5 39.6, s4 24.0, s6 25.0, S2 19.2, S4 17.8, S5 16.8, r3 21.6, R1 12.6, R1 12.6, JV5 24.0, macrosetae on leg Ⅳ: genu 17.0, tibia 18.8, basitarsus 29.2.

Specimens examined. 9♀ & 4♂, Mujuguchondong, Muju, JB, 16-Ⅷ-1989, on *Prunus itosakura S.*; 9♀ & 2♂, Mujuguchondong, Muju, JB, 16-Ⅷ-1989, on *Quercus acutissima* Carruth; 7♀ & 1♂, Mujuguchondong, Muju, JB, 4-Ⅶ-1990, on *Ulmus davidiana* Planch. var. *japonica* Nakai; 2♀ & 1♂, Mujuguchondong, Muju, JB, 4-Ⅶ-1990, on *Styrax obassia* S. et Z.; 2♀ & 1♂, Mujuguchondong, Muju, JB, 4-Ⅶ-1990, on *Acer pseudo-sieboldianun*(Paxton) Kom.; 3♀ & 2♂, Mujuguchondong, Muju, JB, 30-Ⅶ-1992, on *Magnolia sieboldii* K. Koch.



Figs. 155-163. *Typhlodromus chinensis* Ehara et Lee. 155, dorsum(♀); 156, venter of idiosoma(♀); 157-158, spermateca; 159, chelicera(♀); 160, genu, tibia, and basitarsus of leg Ⅳ(♀); 161, dorsm of idiosoma(♂); 162, chelicera(♂); 163, ventrianal shield(♂).

Distributions. Korea, Hong Kong.

Remarks. *T chinensis* has a macroseta on genu Ⅲ and seta Z4 shorter than distance between bases of Z4 and S5.

***Tvphlodromus* (*Galendromus*) *occidentalis* Nesbitt 서양이리응애 (Figs. 164-172)**

Typhlodromus occidetalis Nesbitt, 1951, p. 29-30; Collyer, 1964, p. 63; Chant *et al.* 1974, p. 1276-1277, figs. 34-37; Collyer, 1982, p. 128, fig. 4; Chant and Yoshida-Shaul, 1984, p. 1868-1870, figs, 23-26.

Typhlodroms (*Typhlodromus*) *occidentalis* Nesbitt: Chant, 1959, p. 59, figs. 46-65.

Galendromus (*Galendromus*) *occidentalis* (Nesbitt): Denamark, 1982, p. 143-145, figs. 37-43.

Metaseiulus occidentalis (Nesbitt): Schuster and Pritchard, 1963, p. 214-217, fig. 14.

Typhlodromus (*Galendromus*) *occidentalis* Nesbitt: Ryu and Lee, 1992, p. 36-38, figs. 69-77.

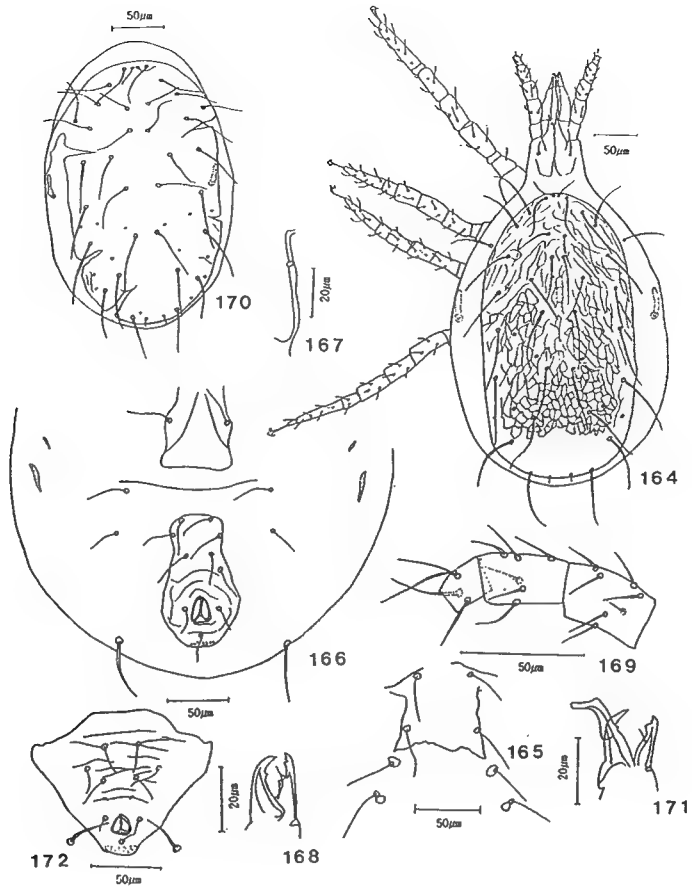
Female. Dorsal shield 346 long, 177 wide at level of waist; reticulate, with at least 4 pairs of pores and 17 pairs of setae. No setae S4 and R1. Seta r3 on intersuctal membrane, smooth. Peritreme very short, extending to the level of coxa Ⅲ. Sternal shield with posterior margin concave or not straight, with 2 pairs of setae, ST1 and ST2, third pairs, ST3, on separate platelets; metasternal platelets roundish. Ventrianal shield slender, longer than width, sligtly narrower than genital shield, widest at level of anus; 6 or 7 preanal setae. 3 pairs of setae on mumbrane surrounding ventrianal shield; seta JV5 smooth. 2 pairs of metapodal platelets. Spermatheca with cervix narrow, elongete, tube-shaped. Fixed digit with 3 teeth and pilus dentilis; movable digit unidentate. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/1, 2/0-1, Leg without macroseta. Lengths of setae (n=10, mean): J1 22.6, j3 58.2, j4 39.8, j5 51.0, j6 66.4, J2 70.4, J5 8.4, z2 60.3, z3 52.6, z4 61.8, z5 50.8, Z4 67.3, Z5 62.5, s4 64.7, s6 71.6, S2 71.8, S5 64.5, r3 46.9, JV5 53.5.

Male. Seta r3 on dorsal shield. Peritreme very short, extending to the level of coxa Ⅲ. Ventrianal shield not fused with peritrematal shield; 3 pairs of preanal setae, a pair of pores. Chelicera with 3 teeth and pilus dentilis on fixed digit; movable digit unidentate. Spermatodactyl as figured. Lengths of setae (n=4, mean): j1 20.0, j3 47.5, j4 36.0, j5 45.0, j6 53.0, J2 57.3, J5 8.3, z2 52.0, z3 49.0, z4 51.8, z5 46.5, Z5 49.8, s4 56.0, s6 61.0, S2 62.0, S5 49.5, r3 40.0, JV5 36.8.

Specimens examined. 2♀ & 1♂, Kangnug, GW, 27-Ⅶ-189, on *Prunus serrulata* Lindley var. *spontanea* (Max.) Makino; 3♀ & 2♂, Kangnung, GW, 11-Ⅷ-1989, on *Prunus serrulata* var. *spontanea;* 4♀ & 2♂, Kangnung, GW, 11-Ⅷ-1989, on *Juglans mandshurica* Max.; 1♀, Chongpyong, GG, 12-Ⅷ-1989, on *Castanea crenata* S. et Z.

Distributions. Korea, Canada, Israel, South Africa, Taiwan, U.S.A., the former U.S.S.R.

Remarks. Subgenus *Glendromus* Muma, 1961 included in the genus *Typhlodromus* Scheuten, 1857 is characterized by setae S4 absent on dorsal shield and R1 absent on interscutal membrane. Unique characteristic in *T.* (*G.*) *occidentalis* is not to have one or both setae of JV3. The karyotypes of this species revaled that this species has a haploid number of 3 and a diploid number of 6 charomosomes (Wysoki and Swirski 1968; Wysoki 1985). This species was collected on *Prunus serrulata* var. *spontanea* together with spider mites, *Tetranychus vienensis* Zacher and *Panonychus citri* McGregor.



Figs. 164-172. *Typhlodromus occidentalis* Nesbitt. 164, dorsum(♀); 165, sternal shield(♀); 166, posterior ventral surface(♀); 167, spermatheca; 168, chelicera(♀); 169, basitarsus, tibia, and genu of leg Ⅳ (♀); 170, dorsum of idiosoma(♂); 171, chelicera(♂); 172, ventrianal shield(♂)

***Phytoseius* (*Phytoseius*) *blakistoni* Ehara 그물무늬이리응애 (Figs. 173-178)**

Phytoseius (*Phytoseius*) *blakistoni* Ehara, 1966, p. 14-15, figs. 20-26; Ehara, 1972, p. 169; Ehara, 1975, p. 27, 32, fig. 17; Ehara, 1977, p. 31; Ehara, 1980, p. 57, fig. 16-A; Lee and Ryu, 1989, p. 222-224, fig. 5A-F; Ryu and Ehara, 1990, p. 150.

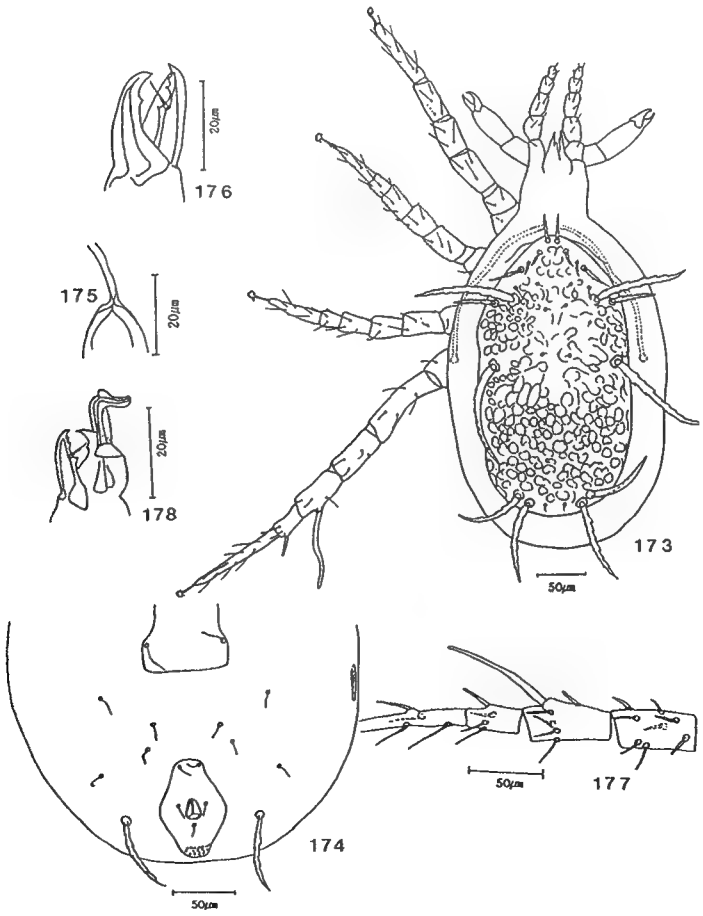
Female. Dorsal shield 308 long, 158 wide at level of waist;rugose, with 15 pairs of setae. Setae on dorsal shield: j1, j3, z3, Z4 Z5, s4, s6, and r3 stout, strongly serrate, set on tubercles; z2 and z4 slightly serrate; the remaining setae shorter, smooth; s6 the longest; r3 slightly longer than z3; j1 longer than j3. Peritreme extending to seta j1. Sternal shield with 3 pairs of setae; metasternal platelets variable in shape. Ventrianal shield oval, narrower than genital shield, with a pair of preanal seta (JV2); no preanal pores. 5 pairs of setae on mumbrane surrounding ventrianal shield; seta JV5 stout, serrate. A pair of very slender metapodal platelets. Spermatheca as figured. Fixed digit of chelicera with 2 subapical teeth, 1 middle tooth, and pilus dentilis; movable digit unidentate. Chaetotaxic

formula: genu II, 2-2/0, 2/0-1; genu III, 1-2/0, 2/0-1, Leg IV with 3 blunt-ended macrosetae. Lenghts of setae (n=10, mean): j1 30.4, j3 21.8, j4 8.5, j5 8.1, j6 8.0, J5 7.9, z2 16.1, z3 39.8, z4 15.0, z5 8.6, Z4 73.7, Z5 88.4, s4 95.4, s6 105.2, r3 45.8, JV5 60.3, macrosetae on leg IV: tibia 73.0, basitarus 21.9, telotarsus 24.9.

Male. Peritreme not extending to seta j1. Ventrianal shield not fused with peritrematal shield, with 3 pairs of setae. Fixed digit of chelicera with 2 subapical teeth, 1 middle tooth, and pilus dentilis; movable digit unidentate. Spermathodactyl as figured. Lenghts of setae (n=3, mean): j1 22.1, j3 14.2, j4 6.8, j5 6.5, j6 6.2, J5 5.8, z2 12.5, z3 29.9, z4 11.1, z5 6.2, Z4 35.4, Z5 42.0, s4 52.3, s6 56.2, r3 34.7, JV5 18.5, macrosetae on leg IV: tibia 27.8, basitarsus 18.7, telotarsus 17.3.

Specimens examined. 3♀ & 1♂, Mt. Sonun-san, Kochang, JB, 19-VIII-1988, on *Castanea crenata* S. et Z.; 10♀ & 2♂, Mt. Sonun-san, Kochang, JB, 19-VIII-1988, on *Fraxinus rhynchophylla* Hance; 1♀, Mt. Sonun-san, Kochang, JB, 19-VIII-1990, on *Carpinus tschonoskii* Max.

Distributions. Korea, Japan.



Figs. 173-178. *Phytoseius blakstoni* Ehara. 173, dorsum(♀); 174, posterior ventral surface (♀); 175, spermatheca; 176, chelicera(♀); 177, tarsus, tibia, and genu of leg IV (♀); 178, chelicera(♂).

Remark. *P. blakistoni* has only a pair of preanal setae (JV2) on ventrianal shield.

***Phytoseius* (*Phytoseius*) *capitatus* Ehara 두상이리응애 (Figs. 179-186)**

Phytoseius (*Phytoseius*) *capitatus* Ehara, 1966, p. 15-16, figs. 27-32; Ehara, 1972, p. 170; Ehara, 1975, p. 27; Ehara, 1977, p. 32, Ryu and Lee, 1992, p. 38-40, figs. 78-85.

Female. Dorsal shield 289 long, 148 wide at level of waist; rugose. Setae on dorsal shield: j1. j3, z3, Z4, Z5 s4, s6, and r3 stout, strongly serrate, set on tubercles; Z4 slightly serrate; the remaining setae shorter, smooth; Z4 about as long as s6 and longer than s4; r3 longe than j1 and z3. Peritreme extending to seta j1. Sternal shield with 3 pairs of setae; metasternal platelets variable in shape. Ventrianal shield slender, narrower than genital sheld, with 3 pairs of preanal setae; no preanal pores. Seta JV5 stout, strongly serrate. A pair of very slender matapodal platelets. Spermatheca as figured. Fixed digit in chelicera with 2 subapical teeth, 1 middle tooth, and pilus dentilis; movable digit unidentate. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/0, 2/0-1. Leg Ⅳ with 3 blunt-ended macrosetae. Lenghts of setae (n=10, mean): j1 27.7, j3 20.8, j4 9.7, j5 9.2, j6 9.7, J5 10. 6, z2 12.2, z3 31.5, z4 15.6, z5 9.6, Z4 65.9, Z5 69.6, s4 52.2, s6 66.0. r3 37.0, JV5 43.2, macrosetae on leg Ⅳ: tibia 43.0, basitarsus 33.5, telotarsus 25.3.

Male. Peritreme not extending to seta j1. Ventrianal shield not fused with peritrematal shield, with 3 pairs of setae; 3 pairs of pores. Fixed digit of chelicera with 2 subapical teeth, 1 middle tooth, and pilus dentilis; movable digit unidentate. Spermatodactyl as figured. Lenghts of setae (n=5, mean): j1 20.2, j3 18.0, j4 7.2, j5 7.4, j6 7.6, J5 7.2, z2 10.0, z3 24.6, z4 14.2, z5 7.8, Z4 35.0, Z5 37.2, s4 35.6, s6 33.2, r3 27.2, JV5 15.8, macrosetae on leg Ⅳ: tibia 14.8, basitarsus 21.0, telotarsus 25.3.

Specimens examined. 1♀, Iri, JB, 14-Ⅶ-1988, on *bamboo;* 13♀ & 3♂, Unam, Imshil, JB, 24-Ⅷ-1988, on *Viburnum wrightii* Miq.; 1♀, Unam, Imshil, JB, 24-Ⅷ-1988, on *Castanea crenata* S. et Z.: 14 ♀ & 2♂, Iri, JB, 23-Ⅵ-1990, on *Korria japonica* (L.) Dc.; 15♀ & 4♂, Iri, JB, 23-Ⅵ-1990, on *Carpinus laxiflora* Bl.; 16♀ & 5♂, Mt. Wolchul, Yongam, JN, 29-Ⅵ-1989, on *Pyrus ussuriensis* Max.; 14♀ & 2♂, Chungju, CB, 7-Ⅷ-1989, on *Prunus serrulata* Lindley var. *spontanea* (Max.) Makino; 1♀ & 2♂, Suanbo, CB, 20-Ⅶ-1990, on *Ulmus davidiana* Planch. var. *japonica* Nakai; 1♀, Tanyang, CB, 21-Ⅶ-1980, on *Actinidia agruta* Planch.

Distributions. Korea, Japan.

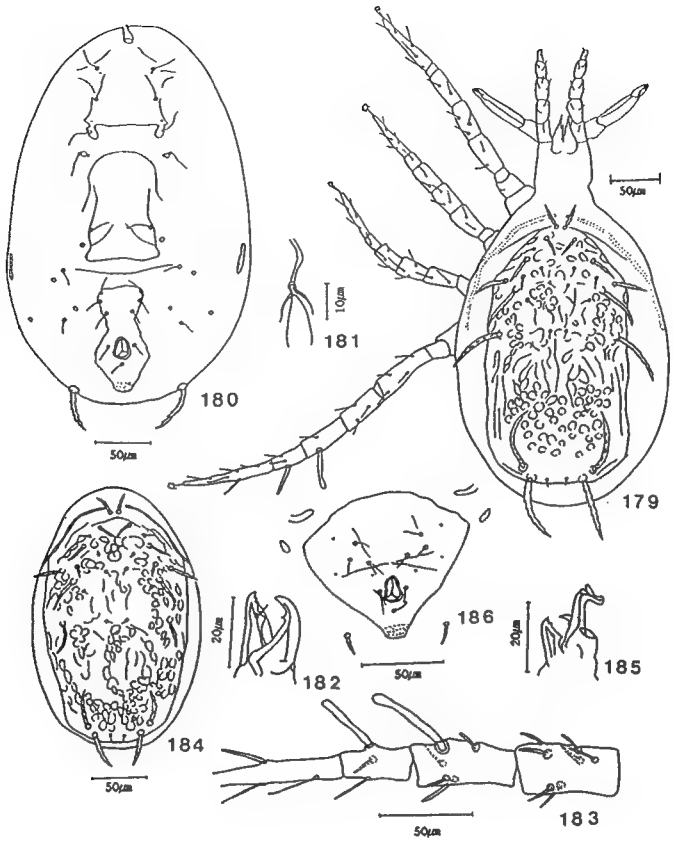
Remarks. Previously *P. capitatus* was known from Japan.

***Phytoseius* (*Phytoseius*) *nipponicus* Ehara 일본이리응애 (Figs. 187-193)**

Phytoseius (*Dubininellus*) *nipponicus* Ehara, 1962, p. 55-56, figs. 7-11; Denamark, 1966, p. 90, fig. 38.

Phytoseius (*Phytoseius*) *nipponicus* Ehara, 1966, p. 26; Ehara, 1967, p. 227-228, figs. 61-63; Ehara, 1975, p. 27-28, 33, figs. 2, 22; Ehara, 1977, p. 32; Ehara, 1980, p. 57, fig. 16-C; Lee and Ryu, 1989, p. 220-222, fig. 4A-F; Ryu and Ehara, 1990, p. 150.

Female. Dorsal shield 311 long, 159 wide at level of waist; reticulate along lateral margins. Setae on dorsal shield: j1, j3 z3, Z4, Z5, s4, s6, and r3 stout. strongly serrate, set on tubercles; the remaining setae shorter, smooth; s4 slightly longer than Z5 and s6 and longer than Z4; r3 longer than j1



Figs. 179-186. *Phytoseius capitatus* Ehara. 179, dorsum(♀); 180, venter of idiosoma(♀); 181, spermatheca; 182, chelicera(♀); 183, tarsus, tibia, and genu of leg Ⅳ(♀); 184, dorsum of idiosoma(♂); 185, chelicera(♂); 186, ventrianal shield(♂).

and j3. Peritreme not extending to seta j1. Sternal shield with 3 pairs of setae; metasternal platelets roundish. Ventrianal shield slender, narrower than genital shield, concave laterally, with 3 pairs of preanal setae; no preanal pores. Seta JV5 stout, strongly serrate. A pair of very slender metapodal platalets. Spermatheca as figured. Fixed digit in chelicera with 2 subapica teeth, 1 middle tooth, and pilus dentilis; movable digit unidentate. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/0, 2/0-1. Leg Ⅳ with 3 spatulate macrosetae; tip of each macroseta with a hyaline envelope, Lenghts of setae (n=10, mean): j1 32.3, j3 31.2, j4 6.7, j5 6.4, j6 6.7, J5 5.3, z2 9.4, z3 26.4, z4 12.2, z5 7.2, Z4 64.2, Z5 70.5, s4 78.3, s6 73.3, r3 42.3, JV5 45.5, macrosetae on leg Ⅳ: tibia 66.8, basitarsus 18.3, telotarsus 22.6.

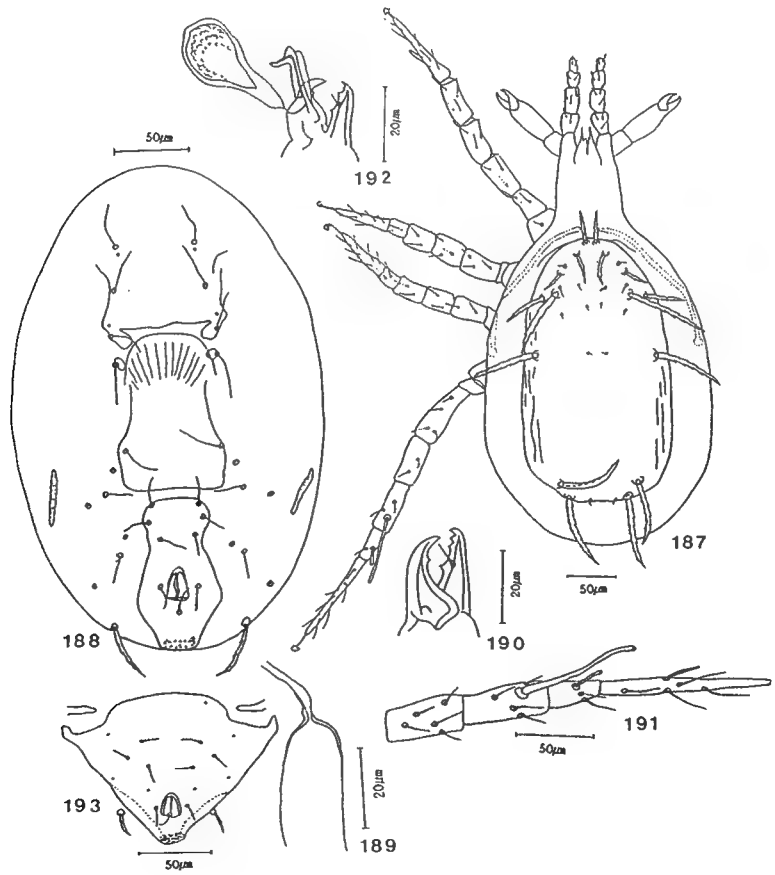
Male. Peritreme not extending to seta j1. Ventrianal shield not foused with peritrematal shield, with 3 pairs of setae; 3 pairs of pores. Fixed digit of chelicera with 2 subapical teeth, 1 middle tooth, and pilus dentilis; movable digit unidentate. Spermatodactyl as figured. Lenths of setae (n=3,

mean): j1 24.5, j3 23.5, j4 5.9, j5 5.6, j6, 6.1, J5 4.7, z2 8.3, z3, 18.9, z4 10.3, z5 6.2, Z4 32.1, Z5 37.9, s4 47.3, s6 42.3, r3 31.3, JV5 11.1, macrosetae on leg Ⅳ: tibia 23.0, basitarsus 16.6, telotarsus 19.5.

Specimens examined. 5♀, Chonju, JB, 22-Ⅶ-1988, on *Hemiptelea davidii* Planch.; 5♀ & 3♂, Unam, Imshil, JB, 24-Ⅷ-1988, on *Rhus verniciflua* Stokes; 5♀♀, Unam, Imshil, JB, 24-Ⅷ-1988, on *Diospyros lotus* L.; 4♀ & 2♂, Soyang, Wanju, JB, 6-Ⅵ-1990, on *Corylus heterophylla* var. *thunbergii* Bl.; 5♀ & 1♂, Mt. Palgong-san, GB, 2-X-1989, on *Alnus hirsuta* var. *sibirica* (Spach) Schneid.; 4♀ & 1♂, Milyang, GN, 2-X-1989, on *Alnus hirsuta* var. *sibirica*; 16♀ & 1♂, Milyang, GN, 2-X-1989, on *Quercus acutissima* Carruth.

Distributions. Korea, Japan.

Remarks. *P. nipponicus* has a very long macroseta on tibia Ⅳ and laterally retaiculate on the dorsal shield. One specimen of male has a spermathopore on the movable digit of chelicera(Fig. 192).



Figs. 187-193. *Phytoseius nipponicus* Ehara. 187, dorsum(♀); 188, venter of idiosoma(♀); 189, spermatheca; 190, chelicera(♀); 191, genu, tibia, and tarsus of leg Ⅳ(♀); 192, chelicera(♂); 193, ventrianal shield(♂).

***Phytoseius* (*Phytoseius*) *crenatus* n. sp. 밤이리응애(신칭) (Figs. 194-201)**

Female. Idiosoma 390 long, 251 wide at level of waist; dorsal shield 314 long, 168 wide at level of waist. Dorsal shield rugose. Setae on dorsal shield: j1, j3, z3, Z4, Z5, s4, s6, and r3 stout, strongly serrate, set on tubercles; z2, z4 and J5 serrate; the remaining setae shorter, smoooth; r3 on dorsal shield; s4 the longest; Z4 longer than Z5 and S6; r3 slightly longer than Z3; j3 longer than j1; z4 about as long as z2. Peritreme extending to seta j1; pertitrematal shield fused anteriorly with dorsal shield. Sternal shield with projections posterolaterally, with 3 pairs of setae; metasternal platelets wider than length. Venterianal shield slender, narrower than genital shield, concave lateally, with 3 pairs of preanal setae; a pair of very small, indistinct preanal pores. Seta JV5 stout, strongly serrate. A pair of very slender metapodal platelets. Spermatheca as figured. Fixed digit of chelicera with 2 subapical teeth, 1 middle tooth, and pilus dentilis; movable digit unidentate. Chaetotaxic formula: genu Ⅱ, 2-2/0. 2/0-1; genu Ⅲ, 1-2/0, 2/0-1. Leg Ⅳ with 3 blunt-ended macrosetae or sometimes bulbous tips of that. Lenths of setae (n=10, mean ±S.E.). j1 33.0±0.6, j3 41.1±1.2, j4 5.2±0.1, j5 5.1±0.2, j6 6.1±0.3, J5 12.4±0.4, z2 19.4,±0.5, z3 44.9±0.7, z4 21.4±0.7, z5 5.9±0.2, Z4 91.7±1.4, Z5 84.2±1.5, s4 133.5±1.7, s6 78.7±1.4, r3 49.7±1.2, JV5 52.5±1.1, macrosetae on leg Ⅳ: tibia 79.0±0.8, basitarsus 27.9±0.9, telotarsus 26.1±0.8.

Male. Idisoma 254 long, 168 wide at level of waist. Peritreme not extending to seta j1. Ventrianal shield not fused with peritrematal shield, with 3 pairs of preanal setae; 4 pairs of pores. Fixed digit of chlicrea with 2 subapical teeth, 1 middle tooth, and pilus dentilis; movable digit unidentate. Spermatodactyl as figured. Chaetotaxic formula of genua Ⅱ and Ⅲ same as female. Leg Ⅳ with 3 blunt-ended macrosetae or sometimes bulbous tips of that. Lengths of setae (n=10, mean ±S.E.). j1 23.9±0.6, j3 25.5±0.5, j4 4.7±0.2, j5 4.7±0.2, j6 4.9±0.2, J5 8.7±0.3, z2 14.0±0.4, z3 29.2±0.5, z4 17.8±0.3, z5 5.3±0.2, Z4 41.3±0.9, Z5 43.3±0.6, s4 53.5±0.9, s6 44.6±0.9, r3 35.7±0.6, JV5 17.8±0.4, macrosetae on leg Ⅳ: tibia 24.5±0.7, basitarsus 20.6±0.5, telotarsus 20.0±0.3.

Type series. Holotype: ♀, Soyang, Wanju, JB, 18-Ⅵ-1992, on *Castanea crenata* S. et Z. Allotype: ♂, data the same as for holotype. Paratypes: 10♀ & 2♂, data the same as for holotype; 2♀ & 2♂, Mujuguchondong, Muju, JB, 4-Ⅶ-1990, on *Castanea crenata;* 2♀ & 1♂, Soyang, Wanju, JB, 6-Ⅵ-1990, on *Castanea crenata;* 2♀ & 2♂, Mujuguchondong, Muju, JB, 8-Ⅷ-1988, on *Castanea crenata.*

Distributions. Korea,

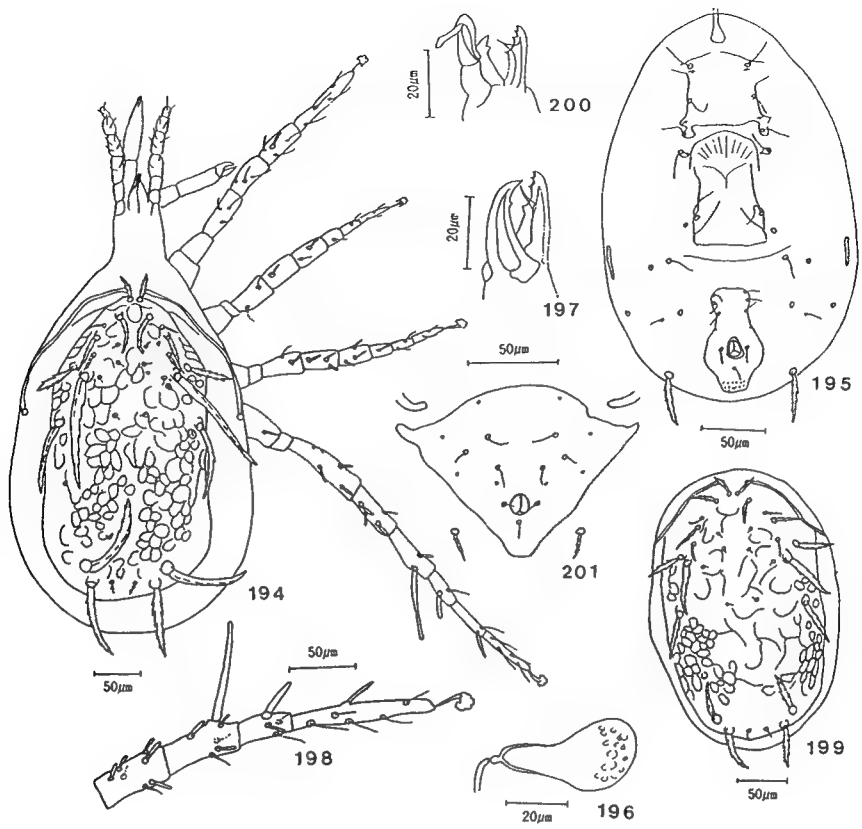
Remark. *Phytoseius* (*P.*) *crenatus* is very close to *Phytoseius* (*P.*) *scabiosus* Xin, Liang, et Ke, 1983 (China), but differs from the latter in the three pairs of preanal setae on ventrianal shield, in the serrated seta J5, and in the longer setae z2, Z4, and macroseta on tibia Ⅳ.

***Phytoseius* (*Phytoseius*) *mori* Xin, Liang et Ke 꽃무늬이리응애 (Figs. 202-209)**

Phytoseius (*Phytoseius*) *mori* Xin, Liang et Ke, 1983, p. 47, figs. 13-18.

Phytoseius mori Xin, Liang et Ke: Ryu and Ehara, 1992, p. 725-727, figs. 7-14.

Female. Dorsal shield 300 long, 149 wide et level of waist; rugose. Setae on dorsal shield: j1, j3, z3, Z4, z5, s4, s6, and r3 stout, strongly serrate, set on tubercles; the remaining setae shorter, smooth; s4 the longest; Z4 slightly longer than Z5 and s6; j1 slightly longer than z3; j3 about as



Figs. 194-201. *Phytoseius crenatus* n. sp. 194, dorsum(♀); 195, venter of idiosoma(♀); 196, spermatheca; 197, chelicera(♀); 198, genu, tibia, and tarsus of leg Ⅳ(♀); 199, dorsum of idiosoma(♂); 200, chelicera(♂); 201, ventrianal shield(♂).

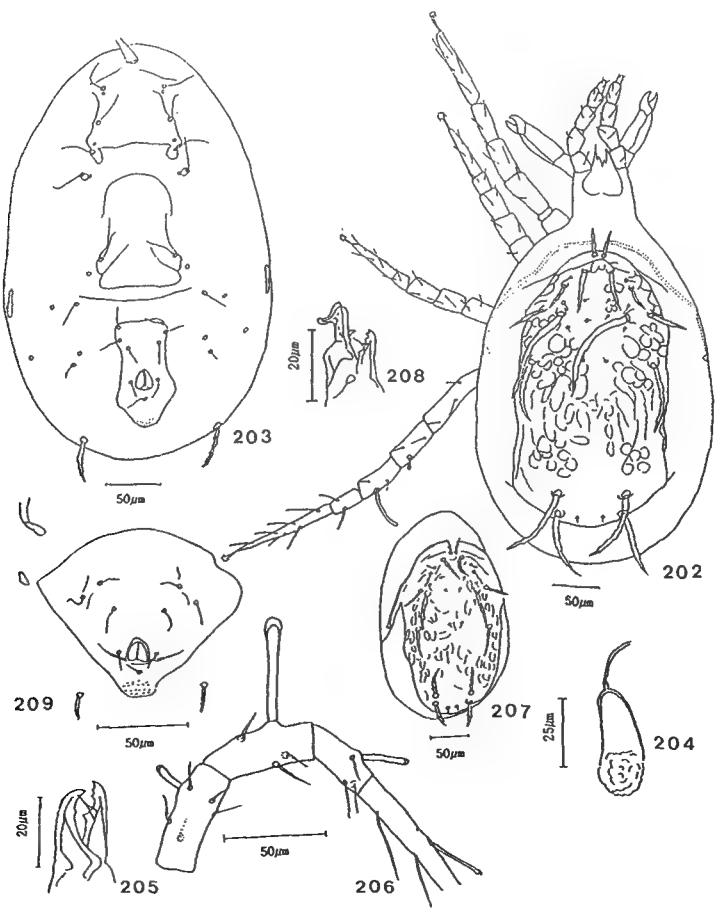
long as r3, Peritreme extending to seta j1. Sternal shield with 3 pairs of setae; metastenal platelets variable in shape. Ventrianal shield slender, narrower than genital shield, with 3 pairs of preanal setae; no preanal pores. Seta JV5 stout, strongly serrate. A pair of very slender metapodal platelets. Spermatheca with cervix much longer than width. Fixed digit of chelicera with 2 subapical teeth, 1 middle tooth, and pilus dentilis; movable digit unidentate. Chaetotaxic formula: genu Ⅱ, 2-2/0, 2/0-1; genu Ⅲ, 1-2/0, 2/0-1. Leg Ⅳ with 4 spatulate macrosetae; tip of each macroseta with a hyaline envelope. Lengths of setae (n=10, mean): j1 31.7, j3 43.5, j4 4.7, j5 4.7, j6 4.8, J5 5.7, z2 11.9, z3 27.9, z4 10.7, z5 4.7, Z4 76.7, Z5 69.6, s4 107.9, s6 68.9, r3 42.8, JV5 40.3, macrosetae on leg Ⅳ: genu 15.7, tibia 46.5, basitarsus 24.1, telotarsus 25.7.

Male. Peritreme extending to seta j1. Ventrianal shield not fused with peritrematal shield, with 3 pairs of preanal setae. Fixed digit of chelicera with 2 subapical teeth, 1 middle tooth, and pilus dentilis; movable digit unidentate. Spermatodactyl as figured. Lengths of setae(n=10, mean): j1 24.2, j3 33.9, j4 4.5, j5 4.2, j6 4.2, J5 5.0, z2 9.1, z3 22.6, z4 9.4, z5 4.6, Z4 41.9, Z5 38.3, s4 61.8, s6 43.4, r3 32.7, JV5 16.3, macrosetae on leg Ⅳ: genu 12.2, tibia 16.7, basitarsus 22.7, telotarsus 24.2.

Specimens examined. 21♀ & 5♂, Tongsandong, Chonju, JB, 5-Ⅵ-1988, on *Cudrania tricuspidata* Bureau; 4♀, Chonbuk Univ. Campus, Chonju, JB, 16-Ⅹ-1987, on *Firmiana simplex* W.F. Wight; 2♀ & 2♂, Iri, JB, 14-Ⅶ-1988, on *Prunus sargentii* Rehder; 16♀ & 1♂, Soyang, Wanju, JB, 22-Ⅶ-1990, on *Lindera obtusiloba* Bl.; 9♀ & 8♂, Mt. Chiri-san, Namwon, JB, 22-Ⅶ-1990, on *Ulmus davidians* Planch. var. *japonica* Nakai; 3♀, Mt. Naejang-san, Chongup, JB, 1-Ⅷ-1990, on *Diospyros kaki* Thunb; 4♀, Mt, Chiak-san, Wonju, GW, 11-Ⅷ-1989, on *Cornus officinalis* S. et Z.; 1♀, Chunchon, GW, 12-Ⅷ-1989, on *Koelreuteria paniculata* Laxm.; 22♀ & 2♂, Sansong park, Kongju, CN, 22-Ⅸ-1989, on *Brousonetia papyrifera* (L.) Vent.; 2♀, Milyang, KN, 2-Ⅹ-189, on *Ailanthus altissima* Swingle; 1♀ Chungju, CB, 7-Ⅷ-1989, on *Celtis koraiensis* Nakai; 1♀, Whayanggugok, CB, 20-Ⅶ-1990, on *Diospyros lotus* L.; 17♀ & 4♂, Tanyang, CB, 21-Ⅶ-1990, on *Ulmus davidiana* var. *japonica*.

Distributions. Korea, China.

Remarks. *P. mori* was recorded only from China (Shanghai). This species has four macrosetae on leg Ⅳ with a hyaline envelope.



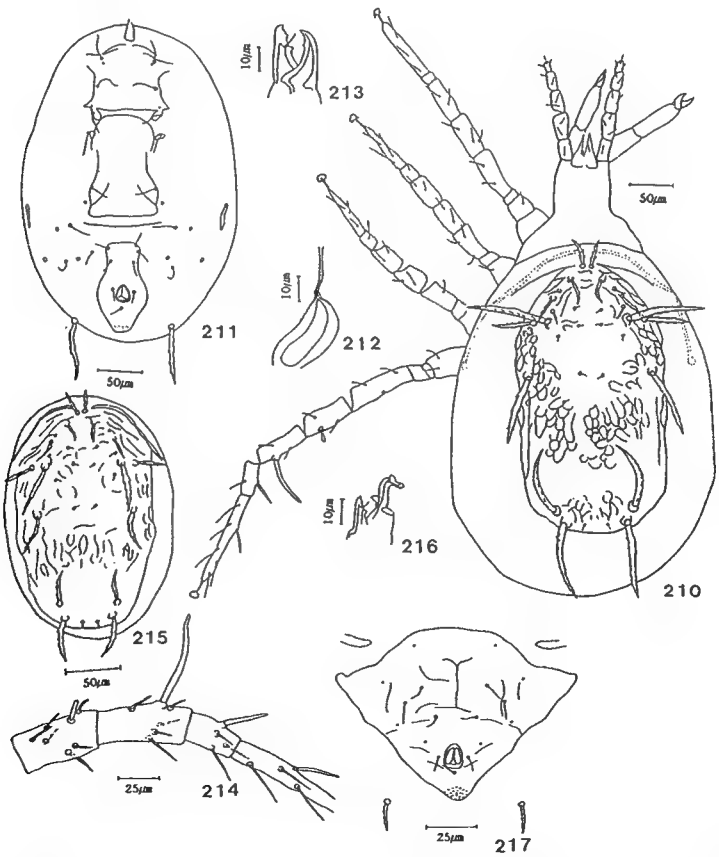
Figs. 202-209. *Phytoseius mori* Xin, Liang, et Ke. 202, dorsum(♀); 203, venter of idiosoma (♀); 204, spermatheca; 205, chelicera (♀); 206, genu, tibia, and tarsus of leg Ⅳ (♀); 207, dorsum of idiosoma(♂); 208, chelicera(♂); 209, ventrianal shield(♂).

***Phytoseius* (*Phytoseius*) *koreanus* Ryu et Ehara 한국이리응애 (Figs. 210-217)**

Phytoseius (*Phytoseius*) *koreanus* Ryu et Ehara, 1991, p. 23-30, figs. 1-8,

Female. Dorsal shield 311 long, 169 wide at level of wasit; rugose. Setae on dorsal shield: j1, j3, z3, Z4, z5, s4, s6, and r3 stout, strongly serrate, set on tubercles; z4 serrate; the remaining setae shorter, smooth; s4 and Z5 longer than s6 and Z4; r3 longer than j3, z3, and j1; z3 slightly longer than j3. Pertireme extending to seta j1. Sternal shield with 3 pairts of setae; metasternal platlets variable in shape. Verianal shield slender, narrower than genital shield, with 3 pairs of preanal setae; no preanal pores. Seta JV5 stout, strongly serrate. A pair of very slender metapodal platelets. Spermatheca as figured. Fixed digit of chelicera with 3 subapical teeth, 1 middle tooth, and pilus dentilis; movable digit unidentate. Chaetotaxic formula: gunu Ⅱ, 2-2/0. 2/0-1, genu Ⅲ, 1-2/0, 2/0-1. Leg Ⅳ with 4 blunt-ended macrosetae. Lengths of setae (n=10, mean): j1, 33.3, j3 30.9, j4 7.3, j5 6.7, j6, 7.0, J5 8.3, z2 12.8, z3 34.8, z4, 20.1, z5 6.8, Z4 73.6, Z5 91.6, s4, 94.0, s6 78.5, r3 47.8, JV5 61.7, macrosetae on leg Ⅳ: genu 17.7, tibia 61.2, basitarsus 32.3, telotarsus 31.2.

Male. Peritreme not extending byond seta j1. Vetrianal shield not fused with peritrematal shield,



Figs. 210-217. *Phytoseius koreanus* Ryu et Ehara. 210 dorsum (♀); 211, venter of idiosoma (♀); 212, spermatheca; 213, chelicera (♀); 214, genu, tibia, and tarsus of leg Ⅳ (♀); 215, dorsum of idiosoma (♂); 216, chelicera (♂); 217, ventrianal shield (♂)

with 3 pairs of preanal setae; 4 pairs of pores. Fixed digit of chelicera with 3 sbapical teeth and pilus dentilis; movable digit unidentate. Spermatodactyl as figured. Lengths of setae (n=10, mean): j1 25.2, j3 24.9, j4 6.5, j5 6.2, j6 6.4, J5 5.9. z2 9.9, z3 24.9, z4 14.7, z5 6.2, Z4 34.1, Z5 45.9, s4 52.5, s6 45.5, r3 33.3, JV5 19.1, macrosetae on leg Ⅳ: genu 14.7, tibia 24.3, basitarsus 23.6, telotarsus 22.9.

Specimens examined. 3♀ & 2♂, Mujuguchondong, Muju, JB, 7-Ⅷ-1988, on *Styrax obassia* S. et Z.; 8♀ & 9♂, Mujuguchondong, Muju, JB, 4-Ⅵ-1990, on *Ulmus davidiana* Planch. var. *japonica* (Rehd.) Nakai; 3♀, Mujuguchondong, Muju, JB, 30-Ⅷ-1992, on *Magnolia sieboldii* K. Koch.

Dostributions. Korea.

Remarks. *P. koreanus* has a macroseta on genu Ⅳ and a serrated seta z4 and is an endemic species.

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韓國産 이리응애科의 분류학적 정리

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(전북대학교 자연과학대학 생물학과)

본 연구에서는 한국산 이리응애과 -2아과, 3속 5아속, 27종-을 정리하여, 종의 기재와 검색표를 작성하였다. 이 중 신종, 밤이리응애(신칭), *Phytoseius crenatus* sp. nov.를 기재하며, 알락이리응애(신칭), *Amblyseius makuwa* Ehara는 한국에서 처음으로 보고한다.

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